Handbooks of the Flora and Fauna of South Australia, issued by the British Science Guild (South Australian Branch) and published by favor of the Honorable the Premier.

THE MAMMALS

OF

SOUTH AUSTRALIA.

By FREDERIC WOOD JONES, D.Sc.

Part II.

CONTAINING

The Bandicoots and the Herbivorous Marsupials.

(The syndactylous Didelphia.)

WITH ILLUSTRATIONS.

Price: FOUR SHILLINGS.

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NOTE.

In Part I., at pages 94 and 102, the name of the Genus which contains Krefft's Pouched-mouse was given as *Chaetocercus*. This is the name originally used by Krefft in 1866, and it was employed in preference to the most modern name—*Amperta*—given to the Genus by Angel Cabrera in 1919.

As a matter of fact when Krefft employed the term *Chaetocercus* that name was already preoccupied, it having been previously given to an avian Genus (containing certain Swifts) and therefore it was not available for a Genus of Mammals. The name *Amperta*, however, does not stand, for it is antedated by *Dasycercus* employed by Peters in 1875. *Dasycercus* should, therefore, be the name of the Genus (Genus 2, pp. 94 and 102, Part I.), and for the two species *Dasycercus cristicauda* (p. 102) and *Dasycercus hillieri* (p. 109).

For the loan of the blocks of figures 106 and 108-123, previously published in the Records of the South Australian Museum, I am indebted to the Board of Governors of that institution. For the loan of the blocks of figures 92, 95-98, and 138-141, previously published in the Transactions of the Royal Society of South Australia, I am indebted to the Council of that Society.

Sub-Order II.—SYNDACTYLA.

Unlike the didactylous Sub-order of the marsupials, the Syndactyla do not form an entirely simple group. The composite nature of the section, which contains the marsupials having conjoined second and third toes, has already been mentioned (Part I., page 83). We have pictured the origin of the group as consisting essentially in the acquirement of a curious foot specialisation, and we have imagined that originally the animals that attained this specialisation possessed the full set of front teeth typically associated with an insectivorous, carnivorous, or mixed diet. We have further concluded that some of the animals which developed the specialised feet, also developed specialised front teeth—the dental specialisation consisting in a reduction in the number of the front teeth, a modification typically associated with a vegetarian diet. The whole Sub-order may, therefore, be divided into two main groups ; the one with many front teeth, which may be termed Syndactyla Polyprotodontia ; and the other with few front teeth, which may be called Syndactyla Diprotodontia.

Before proceeding to discuss the actual animals which are embraced within these two groups it will be well to examine the peculiarity that bands them all together as Syndactyla. The condition of syndactyly is a very peculiar one, and needs

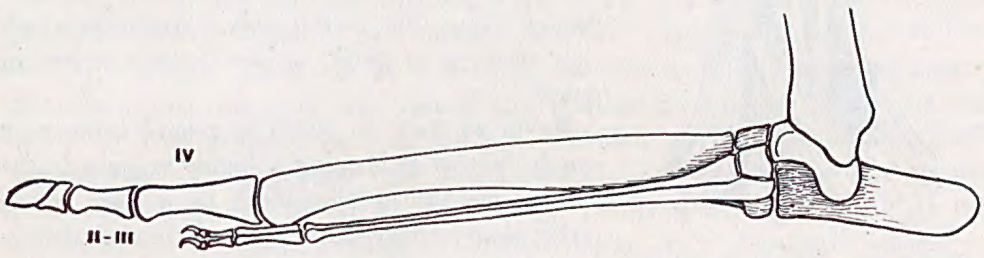

Figure 89.—The skeleton of the right foot of a Kangaroo seen from its inner side to show the slender bones of the syndactylous second and third digits.

discussion both from the point of view of the anatomical adaptations involved and the functional end to which the anatomical arrangements are applied. Anatomically two small toes—the second and third—are bound together in the whole of their length, with the exception of their top joints and their claws. There is thus produced an apparently single toe, terminating in twin tips and twin claws. Beneath the skin are the slender bones which form the shafts of the toes (*see* Figure 89), and the muscles which, properly belonging to two separate toes, have become grouped so as to act on the single compound toe. These muscles can bend the whole compound digit and straighten it again ; and they can also draw it away from the side of the foot and pull it back. so that the syndactylous digit may be placed almost at right angles to the foot, or brought so that it lies in line with the rest of the toes. (*See* Figure 90.)

As to its function, Sir Richard Owen, in 1839, stated clearly that essentially syndactyly consisted in the " conversion of the two inner toes into unguiculate appendages, useful only in cleansing the fur." Despite this plain statement that the syndactylous digits could be employed as hair combs, this function seems

largely to have been lost sight of by later writers. Although Owen assigned a functional role to them, it is quite obvious that he regarded this as only a very secondary thing—a sort of makeshift use for a structure which had fallen behind in perfection. Syndactyly he certainly regarded as a condition of degeneration, for he says "the commencement of a degeneration of the foot which is peculiar to and highly characteristic of marsupial animals may be discerned in the Petaurists, in the slender condition of the second and third toes, as compared with the fourth and fifth."

The idea that this peculiar arrangement of the small second and third toes is the result of degeneration seems to be a very general one among those who have studied the marsupials. It is true that the toes are very small; it is true that they have ceased to play any part in walking or running or climbing, and so may be said not to share in the more obvious functions that we associate with toes. But it must also be admitted, if we reflect for a moment, that it is a very curious thing that toes should join together in a remarkably ordered fashion and then degenerate in company. Plenty of toes have degenerated, and become lost, in the story of the various marsupial groups; but this is the only occasion in which they seem, so to speak, to have become united in death.

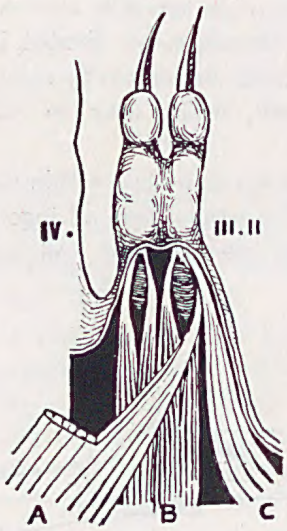

FIGURE 90.—The muscles which act upon the syndactylous toilet digits. A, the muscle which pulls the hair comb to the next digit when unemployed. B, the muscles which bend the claws down. C, the muscle which pulls the comb from the side of the foot for scratching.

Maybe we shall do better to regard these very wonderful toes as forming a highly organised anatomical mechanism specialised as a hair comb, rather than as degenerate toes used in their decaying stages as a hair comb, because there is no other use for them in their decrepitude.

At first sight it might appear that it was a matter of little moment if we regard the syndactylous digits as degenerated or as specialised; but the question is in reality one of some interest. We have already found some reasons for considering that the division of all Didelphia into two groups, distinguished by their dentition as Polyprotodontia and Diprotodontia, was not a satisfactory arrangement. If we are to have two basal groups of polyprotodonts and diprotodonts, then we must assume that syndactyly has been developed independently in each group. Were the condition of syndactyly to be one of simple degeneration, then it is perhaps not difficult to picture it as affecting the pedal digits of certain members of both series independently. But if the condition be the result of a very specialised development, begot in response to the demand of a very definite function, then, though its independent and identical development in both stocks cannot be regarded as in any way impossible, it is sufficiently unlikely to warrant our electing the simple explanation of its only having been developed once, and that in the stock in which it appeared some members retained the primitive polyprotodont dentition and some attained to the more specialised diprotodont stage.

The syndactylous digits attain a very different degree of development in the various members of the group. In some animals the twin toes are long, in some they are short. We might say that the toes are present in a varying degree of degeneration, or we might assume that they were present in a varying degree of specialisation. It needs only a very superficial review of the Syndactyla to realise that the state of development of the syndactylous toes is related to the nature and texture of the hairy coat of the animal, rather than to its systematic position in the series. The Koala (*Phascolarctus cinereus*) has much better developed syndactylous digits than have the Bandicoots. This we suppose to be a consequence of the presence of a long dense woolly coat in the Koala and a short hispid hairy covering in the Bandicoots; and not a result of more degeneration having taken place in the primitive Bandicoots and less degeneration in the far less primitive Koala.

No one who has watched the functional employment of the little twin toes as a hair comb can doubt that they constitute a highly developed and thoroughly efficient toilet implement. The muscles pull the compound toe so that it projects from the side of the foot; it is then slightly bent, and with its little parallel claws the hair is systematically raked wherever the toes can reach. After the combing has been done the comb is cleansed, and for this purpose the lips and teeth are usually employed.

If we seek to find out why this wonderful comb should have been developed we are, of course, confronted by a problem to which it is almost impossible to find the real solution. We can at least say that the development of preening organs and hair combs is a very wide-spread and familiar phenomenon in the animal kingdom. The syndactylous hair comb is, therefore, no isolated or outlandish development. The particular need which called it into existence in only certain of the marsupials can merely be guessed at. We have already (Part I., p. 59) noted that the Biting-lice, known as *Mallophaga*, are very abundant parasites in the hairy coats of many marsupials. *Mallophaga* are certainly much more prevalent in the fur of the Syndactyla than they are in that of the Didactyla. When one of the carnivorous marsupials, which we have already studied, is irritated by something which produces a tickle, it scratches itself with the claws of its hind foot and, if this does not effectively allay the itching or dislodge its cause, it will nibble with its sharp little front teeth, which act as a very fine hair comb. It may be that those marsupials that departed from an insectivorous and carnivorous diet, and started on an increasing specialisation of vegetarianism, missed the sharp little front teeth in the toilet of the coat, and found a substitute in the specialised hair comb of the pedal digits. Bandicoots will nibble their hair; but their ability to nibble it and the effectiveness of their front teeth as hair combs are considerably reduced; for, despite the fact that they are polyprotodonts, their front teeth have fallen from the standard of the sharp pointed incisors of the Didactyla. The pedal hair comb is initiated in them, presumably as an additional toilet implement; its need and its perfection are increased when the many little front teeth have become replaced by the few larger front teeth of the specialised diprotodonts.

For the purposes of classification the Sub-order is, therefore, best divided into two sections, the one containing a far more primitive and generalised set of animals than the other.

SUB-ORDER SYNDACTYLA.

(A.) Syndactylous didelphia with a full set of front teeth.

Section. SYNDACTYLA POLYPROTODONTIA.

(A¹.) Syndactylous didelphia with a reduced set of front teeth.

Section. SYNDACTYLA DIPROTODONTIA.

SECTION I.—SYNDACTYLA POLYPROTODONTIA.

This section contains the more primitive omnivorous members of the Sub-order, known collectively as Bandicoots, which may all be grouped within a single family

FAMILY PERAMELIDAE.

The characters of the members of the Family are as follows :—Fossorial in varying degree, all being adept excavators for the purpose of obtaining food. Practically omnivorous in diet. In general appearance there is a rough resemblance, in the case of the larger species to rabbits, and in the case of the smaller species to rats. The muzzle is elongated and tapering, terminating in a naked rhinarium slightly grooved in the middle line, with nostrils cleft upon their lateral aspects. Ears long or medium. Hind limbs longer than fore limbs. The middle three (or only two) digits of the manus well developed and clawed ; the lateral digits rudimentary or absent. On the pes, the first digit is rudimentary or absent ; the second and third are slender, clawed and syndactylous ; the fourth is the largest toe and continues the mid-line of the axis of the foot. The fifth digit is present, smaller than the fourth, but, like that digit, it carries a well developed claw. The tail is long or medium, hairy or crested. The pouch is present, the mouth opening downwards and somewhat backwards ; the nipples are six or eight in number. The patella is developed. Clavicles are absent.

Dentition I. $\frac{5-5}{3-3}$ or $\frac{4-4}{3-3}$. C. $\frac{1-1}{1-1}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{4-4}{4-4}$. Incisor teeth with flattened, not pointed crowns.

In general it may be said that the Peramelidae are rapidly disappearing over the whole of continental Australia. Although formerly they were very common and familiar animals, they have now disappeared from many of their old haunts, and even though they are still locally abundant in certain spots, their numbers as a whole have vastly diminished in a comparatively few years.

Some thirty species are contained within the Family, and these may be conveniently separated into seven distinct Genera. The Genera are distinguished as follows :—

(A.) Manus with five digits.

(B.) Pes with five digits.

(C.) Skull with large pear-shaped bullae.

Genus 1. *Isoodon.*

(C¹.) Skull with small rounded bullae.
(D.) Incisors $\frac{5-5}{3-3}$.
(E.) Cranium short. Bullae complete.
Genus 2. *Perameles.*
(E¹.) Cranium elongated. Bullae incomplete.
Genus 3. *Peroryctes.*
(D¹.) Incisors $\frac{4-4}{3-3}$.
(F.) Last premolar considerably larger than those in front. Genus 4. *Echimypera.*
(F¹.) Last premolar considerably smaller than those in front. Genus 5. *Suillomeles.*
(B¹.) Pes with four digits. Genus 6. *Thalacomys.*
(A¹.) Manus with three digits. Genus 7. *Choeropus.*

GENUS 1.—ISOODON (Geoffroy, 1817).

The members of the Genus *Isoodon* are sturdily built, compact animals, with short, erect, harsh coats and a general grizzled colouration. The muzzle is elongated into a snout. The rhinarium is naked and marked by a median groove. The ears are short, barely reaching to the eye when laid forwards, and somewhat thick in texture. The main processus antihelicis is large and is twisted upon itself at its margin. The secondary process is small. A well marked sulcus auris posterior or bursa is present, and in addition there is a well developed preauricular pit. (*See* Figure 91.) Manus and pes with naked, coarsely granular, palms and soles. The first and fifth digits of the manus small, the third, second and fourth are well developed and clawed. The first pedal digit is small, the second and third are syndactylous, the fourth and fifth well developed and clawed. There are distinct pads on palm and sole.

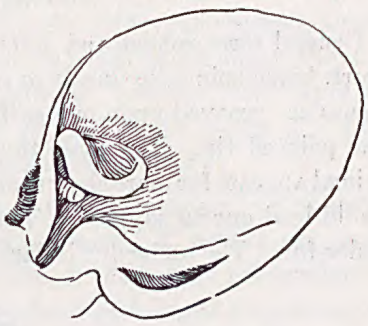

FIGURE 91.—The form of auricle characteristic of the members of the genus *Isoodon*.

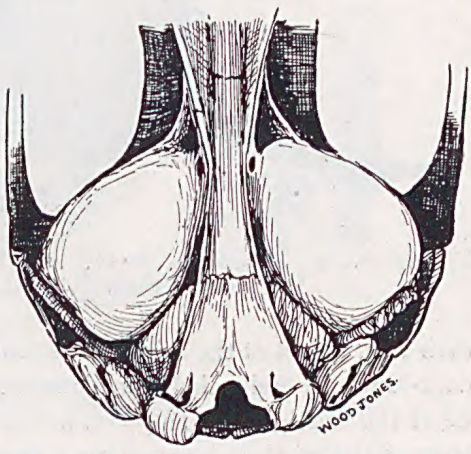

FIGURE 92.—Posterior extremity of the base of the skull of *Isoodon obesulus* to show the form of the bullae. Twice natural size.

Dentition I. $\frac{5\ 5}{3-3}$. C. $\frac{1-1}{1-1}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{4-4}{4-4}$. Bullae large and pear-shaped. (*See* Figure 92.)

Two species inhabit South Australia, the one being a continental and the other an insular form.

KEY TO THE SOUTH AUSTRALIAN SPECIES.

(1) External characters.

(A) Size large: head and body length about 300 mm. Colour a uniform dark grizzle; paler below. *I. obesulus.*

(A^1) Size small: head and body length about 240 mm. Colour lighter; ventral surface pure white. *I. nauticus.*

(2) Cranial characters.

(A) Basal length about 70 mm. Bullae elongated. Skull ridged. Nasals long. *I. obesulus.*

(A^1) Basal length about 50 mm. Bullae truncated. Skull devoid of ridges. Nasals short. *I. nauticus.*

(1) Short-nosed Bandicoot.

ISOODON OBESULUS (Shaw, 1797).

General form robust and compact. (*See* Figure 93.) The coat is composed of short, harsh spines, so fine as to compose a rather crisp, hairy coat. The individual spines are grooved upon one surface and rounded on the other, and they taper to a fine pointed tip. The coat, though harsh and hispid, is glossy; and the living animal appears far more sleek than an examination of dried skins or stuffed specimens would lead one to suppose. Beneath the bristle hairs is a soft, but rather scanty, under-fur. The under-fur is dark-grey in colour; the individual hairs being lighter

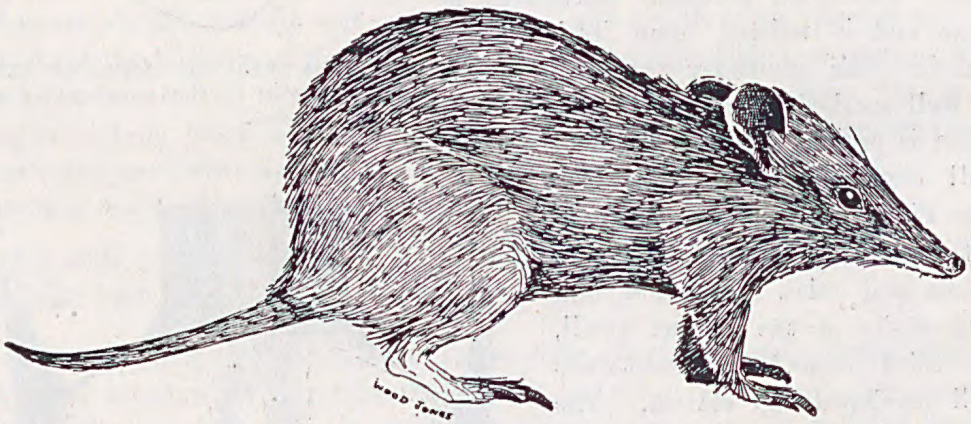

FIGURE 93.—An adult male *Isoodon obesulus*, the animal from Blackwood, Mount Lofty. Slightly less than half natural size.

at their tips. Most of the bristle hairs are banded, being light at their roots, black or dark-brown in their middle portions, and yellow or straw-coloured at their tips. Some of the bristle hairs, however, are brown in the whole of their extent. The banding of the bristle hairs produces a general grizzle of the coat; and the animal, which appears as a warm brown at a short distance, is seen on closer examination to be flecked all over with a very fine grizzle of black and yellow. The inner sides of the limbs and the ventral surface are, as a rule, yellowish-grey; the bristle hairs being greyish and the under-fur almost white. The dorsum of the manus and pes

lighter than the general body colour. The tail is comparatively short, and it is very commonly mutilated, probably as the result of fights. It is uniformly clothed with short hairs, greyish-brown above and dirty-white below. The ears are small and rounded and are clothed, both within and without, with fine yellowish-grey hairs. The processus antihelicis is long and shows a twisted free margin. The bursa, and the curious pre-auricular pit, are well developed. The eye is black. The rhinarium is naked, brown in colour, and grooved in the mid line. In texture the skin of the rhinarium can only be described as tesselated, the surface being marked out by a series of fine lines into a regular mosaic pattern. The nostrils are cleft laterally.

All vibrissae are well developed. The mysticial set is disposed in 5 rows; the individual hairs are dark at the base and pale at the tips, the longest measure 45 mm. The genal set contains half a dozen long vibrissae. There are 3 supra-orbitals, 8 genals, and a larger number of small submentals. The ulnar carpal tuft contains 4 long pale bristles, and a well marked medial ante-brachial bristle is present.

The manus has naked granular palms; three rather ill-defined pads are present at the bases of digits 2, 3, and 4. The first digit is rudimentary, the second, third, and fourth are well developed and strongly clawed, the fifth small and without a free nail. The large second, third, and fourth digits are fusiform, and taper to their tips without differentiated apical pads. The digital formula is $3 > 2 > 4 > 5 > 1$: the third digit not being greatly in advance of the second.

The sole of the pes is granular and often entirely naked in the adult; in younger examples some hair is present in the mid portion of the soles. Three not very well differentiated pads are present; the first, and smallest, at the base of the syndactylous digits, the other two at the bases of the fourth and fifth digits respectively; these last two being commonly more or less conjoined. The first digit is rudimentary and has no claw, the second and third are syndactylous, the fourth and fifth are

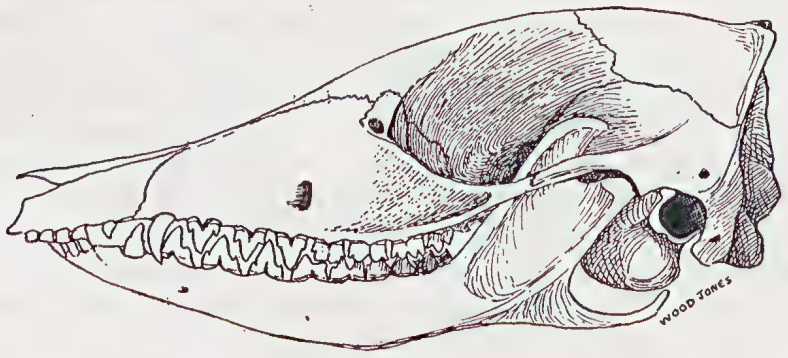

FIGURE 94.—Skull of a South Australian specimen of *Isoodon obesulus*. One and a half times natural size.

well developed and carry strong curved claws. The digital formula is $4 > 5 > 2\text{-}3 > 1$. The pouch opens downwards. The nipples are 8 in number arranged in an incomplete circle. The skull is fairly massive, and the muscular ridges are well marked. (*See* Figure 94.) The bullae are elongated.

DIMENSIONS.

	Typical South Australian Specimen.
	♂
Head and body	340
Tail	120
Hind foot	56
Ear	18

DIMENSIONS OF SKULL.

	South Australian Specimens.			Kangaroo Island.
	♂	♂	♀	♂
Basal length	73	72	62	73
Breadth	34	32	28	34
Nasals, length	28	28	27	31
Palate length	42	42	38	44

It is a regrettable fact that this once familiar little animal is now extremely rare in South Australia. Not very many years ago it was common all over the State; to-day it is on the verge of extinction. It is remarkable and greatly to be deplored that an animal, which was so familiar and abundant in the boyhood of the present generation of South Australians, is likely to cease to exist at all on the South Australian mainland. On Kangaroo Island it still lives in the sanctuary of Flinders Chase, and here it should continue to flourish, its only enemy being the large *Varanus* which is so common on the island.

Although Bandicoots were somewhat unpopular because of their habit of scratching in cultivated land, they are animals that did an immense amount of good, for they possess an untiring energy in searching out and destroying insects. The scratching is done with the object of obtaining insects at the roots of vegetation, rather than for obtaining the roots themselves. For the most part, *I. obesulus* preferred fertile spots where vegetation was abundant, and its elected habitat was therefore the sooner rendered inhospitable by the advent of man with his dogs and cats. South Australia is the poorer for the loss of the Short-nosed Bandicoots, not only because of the great amount of economic good they did as destroyers of noxious insects, but also because they are most engaging and fearless little animals, which are naturally friendly in their disposition, and unsuspicious in their intercourse with man. Most lands are fortunate in possessing some inoffensive animal, which is ready to accept a truce with man, and assume the part of a friendly dependent. Australia has been blessed by possessing an unusual number of such animals, but it is Australia's distinction that almost all of them have been pressed to the very verge of extinction, and one of the most to be regretted is the little Short-nosed Bandicoot. Besides its cheerful assumption of good fellowship with man, the Bandicoot has another attribute which is deserving of respect, and this is its tireless energy. It would be far more appropriate to recommend the sluggard to study the Bandicoot than to urge him to attempt to emulate the ant. So long as a Bandicoot is awake it is busy. It is this very industry that made it unpopular

in the days of its abundance, for it will accomplish an immense amount of scratching in order to secure a beetle burrowed into the earth.

Although nocturnal or crepuscular, as a general rule, it will often spend the whole day in some activity or other, and it appears to be but little handicapped when abroad in bright sunlight. If its nest needs repairing it will work through the hottest day at collecting materials and shifting them to the site of its bed. The nest is constructed by collecting grass and dead leaves, and erecting a mound in a chosen tangle of vegetation. All the herbage around the nest is gathered, grass is scratched up by the roots, and, with infinite industry, a considerable mound is made. The Bandicoot intent on nest building will level off the surrounding vegetation almost as neatly as if a scythe had been over the ground; and for a little while the nest is conspicuous in consequence of the denuded patch of which it forms the central object. After a short time the grass begins to grow, and the material which is gathered for the nest itself, begins to sprout or to germinate from seed, and the nest becomes concealed by its own little thicket of vegetation and is then particularly difficult to detect. No permanent hole is left in the little mound, for the animal burrows in and out at any aspect. Invariably on emerging from the nest it sets about bed making, shaping up the mound and closing over the hole from which it emerged. There is no permanent chamber in these nests; but the animal lies in the middle of the collected material, and if the dome of a newly-made mound is watched, the animal's respiratory movements are easily detected. When it awakes in the evening, a heaving movement is seen in the mound, as though a small earthquake were in progress; the awakened animal breaks out anywhere and immediately starts to repair the damage. Bandicoots seem to have an instinct of the approach of bad weather, for before heavy rain they will add to the nest pile with feverish activity. One that I had in captivity would always leave its open-air nest and retreat to the security of a bed inside a box, and the change of residence was always made in advance of the advent of bad weather.

Bandicoots are desperately pugnacious. An *obesulus* which had been in captivity ever since it was quite small, and which was exceedingly tame, had a much larger *Perameles nasuta* introduced into his run. By morning the *nasuta* was dead and almost entirely plucked. An *Isoodon nauticus* was put into the same run, and it was hoped that the near kinship of the two animals would ensure peace; but the *nauticus* was only rescued in a dying condition.

Their methods of fighting are peculiar. The aggressor will tirelessly follow his victim until he wears it down. Each time they come to close quarters a curious series of little sounds, half-way between a grunt and a squeak, is emitted. This little sound is reminiscent of the noise made by guinea pigs, save that in the one case it is expressive of anger and in the other of contentment. When one animal overtakes the other, and presses it to an engagement, the assault is made by a jump and an endeavour to strike with the claws of the hind feet Each stroke carried home, removes some hair from the victim's back and scratches the thin skin. This style of fighting may continue for a long while, but, as the less aggressive animal tires, the stronger one will attack with a rapid scrambling motion of its fore feet, inflicting damage by strokes of the strong claws of the manus, the strokes being delivered with lightning rapidity. They seem never to fight face to face,

for when the chase leads to such a meeting one instantly jumps over the other, inflicting a blow with the hind foot in passing, and renews the attack from the rear. Only as a last resort, although the whole encounter has been conducted with open mouths, do they start to bite each other.

The curious rapid scrabbling movement of the fore feet, used in fighting, is also employed in dealing with any living prey, or with any unusual object which is regarded with suspicion. If a living worm, or a dead mouse, is offered to *obesulus* the result is always the same; the animal proceeds to roll and kneed the thing along the ground with rapid strokes of its fore feet. The whole time the fore feet are rolling the object, the animal is steadily retreating, and it continues the curious shuffling movement until it has reduced the body of its victim to an almost shapeless mass. Only then is the object allowed to rest, and after a brief examination is eaten or rejected as the case may be. As a rule, when dealing with mice the process is a prolonged one, and in the end the head alone is eaten. In capitivty Bandicoots will eat almost anything. They prefer cooked meat to raw, and they are especially fond of milk puddings and fancy cakes; but even those reared in captivity prefer beetles and other insects to any man-made delicacies. In ordinary slow progression the fore limbs are moved alternately, and the hind limbs synchronously. In rapid progression the fore limbs move together, and alternately with the synchronously acting hind limbs. Although the Bandicoot never develops a saltatory mode of progression, it possesses a capacity for jumping that would not be inferred from its compact and rather heavy build.

Its great guiding sense is olfactory, and its sense of smell, aided by the tactile sensations imparted by the vibrissae, is its most important faculty in all activities connected with the search for food. Nevertheless, the Bandicoot is by no means such a slave to the sense of smell as are some of the higher mammals; its sensory perceptions may be said to be fairly well balanced. Its vision for near objects is good, even in broad daylight. Its auditory appreciation is also well developed, and in captivity it will readily come to a call at feeding time. It seems to be silent at all times save when engaged in its peculiar methods of fighting

The breeding season is in June, and four young are usually produced at a birth.

(2) Nuyts' Islands Bandicoot.

ISOODON NAUTICUS (Thomas, 1922).

An insular form which differs from the Short-nosed Bandicoot of the mainland in directions that commonly distinguish animals living on islands of very restricted area.

On the whole, the animal is distinguished by being smaller, more lightly built, and paler in colour, and by possessing a skull which is remarkably smooth and devoid of muscular impressions. The manus and pes are small, the pads similar to those of *obesulus*. (*See* Figs. 95 and 96.) At first sight the adult insular animal might be taken for a young example of the mainland form; and the skull—even that of an old male—might be mistaken for that of a young female *obesulus*. The animal was first captured on the islands, by the writer, in January, 1922, and Mr. Oldfield Thomas's description of the type specimen is as follows :—" Size markedly

smaller than in the continental *obesulus*, the skull of an adult male only about 55 mm. in length, as compared with 70 mm. or more in *obesulus*. General colour comparatively pale; under surface white; hands and feet with grey-brown metapodials and white digits; tail brown above, whitish below." Details of rhinarium, vibrissae, ear and eyes as in *obesulus*.

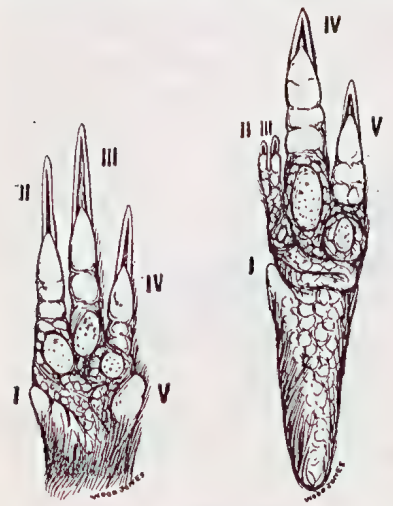

FIGURE 95.—Left manus and pes of *Isoodon nauticus*. Manus one and a half times natural size, pes natural size.

FIGURE 96.—Manus and ulnar carpal vibrissae of *Isoodon nauticus*. Twice natural size.

"Skull far smaller than in *obesulus*, smooth, and almost without cranial ridges, the sagittal crest obsolete, and even the two lateral thickenings of the occipital much less developed than usual. Nasals much shorter and narrower than in *obesulus*. Bullae not nearly as broad as in *obesulus*, but peculiarly shortened, rather abruptly cut off behind. (*See* Figure 97.)

"Teeth small throughout. The three juxtaposed incisors $I.^{2}$ — $I.^{4}$, together about 3 mm., as compared with 4·5 mm. and upwards in *obesulus*. Canines short. Secator and molars all proportionately reduced."

DIMENSIONS.

	Type. ♂	♂
Head and body	242	240
Tail	—	—
Hind foot	50	45
Ear	—	20

DIMENSIONS OF SKULL.

	Type. ♂	♂	♂	♂
Basal length	53	53	51	—
Breadth	25·3	27	25	25
Nasals, length	21·7	20	21	22
Palate length	31	33	30	—

The average interparietal breadth in both *nauticus* and *obesulus* is 12 mm. The very much shorter skull of *nauticus* has therefore a relatively far wider brain case. (*See* Figure 98.)

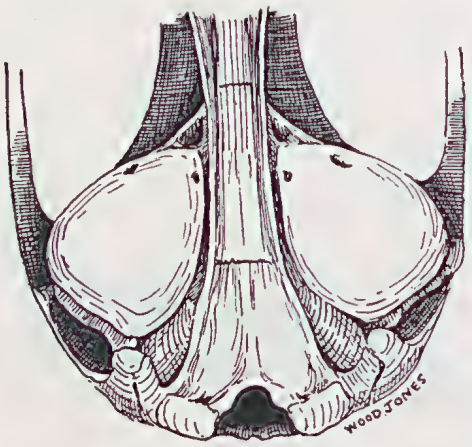

FIGURE 97.—Posterior end of the base of the skull of *Isoodon nauticus* to show the form of the bullae. Twice natural size.

around are little animals moving about, and some of these are Bandicoots and some are the nest-building rat (*Leporillus jonesi*) peculiar to the island. It is by no means easy to tell the one from the other in the twilight, for in size and in colour they are very much alike, but they may be easily distinguished by noting their attitude towards man. The Bandicoots will come right up to the hand for some such delicacy as bread and jam; but the rats take instant alarm when an advance of this sort is made.

In captivity the island Bandicoot displays habits exactly similar to those of its larger mainland relative. On the island it lives in the thick tangles which the strands of *Tetragonia implexicoma* make around low vegetation, and, like the snakes and the rats, it readily avails itself of the shelter of the mutton birds' burrows. Although no nests were found on the island, the animal constructs a nest in captivity. Owing to the density of the Bandicoot population on the island, fights must be very frequent, and only one speci-

This beautiful little Bandicoot lives on two islands in Nuyts' Archipelago. Upon one island, which is inhabited by man, it is comparatively rare, and is certainly doomed to extinction. Upon the other island it exists in large numbers. Its only companions on this island are mutton birds, penguins, nest-building rats, and black tiger snakes: from none of these is it in danger of extermination, and it is much to be hoped that its island sanctuary will long remain inviolate. As soon as it is dark in the uninhabited island, the Bandicoots come abroad in remarkable numbers. All

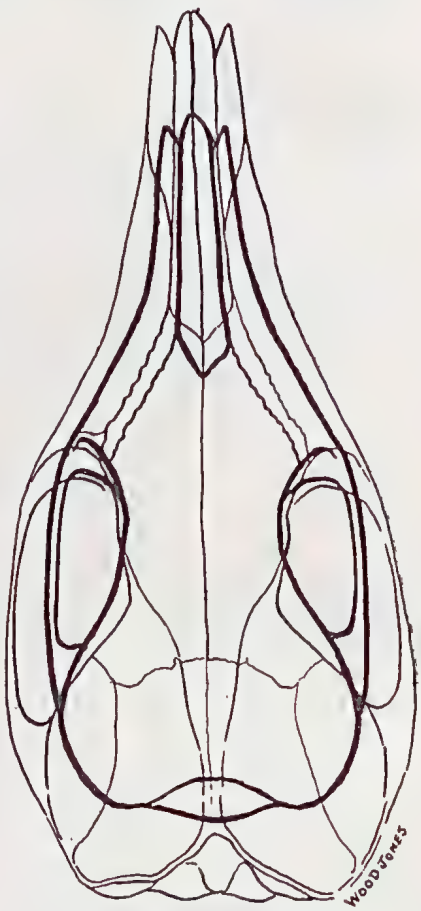

FIGURE 98.—Superimposed outlines of the skulls of *Isoodon nauticus* (thick lines) and *I. obesulus* (fine lines. One and a half times natural size.)

men with a whole tail was captured; all other examples possessed nothing but mere stumps of varying length. Ragged ears are also the rule. It is remarkable how very greatly the males seem to outnumber the females, and no female specimen has yet been captured.

This island is the last place in South Australia where Bandicoots still linger in their former numbers and in their characteristic cheerful fearlessness: it would be a disaster if, through lack of adequate protection, they were permitted to share the fate of the mainland form.

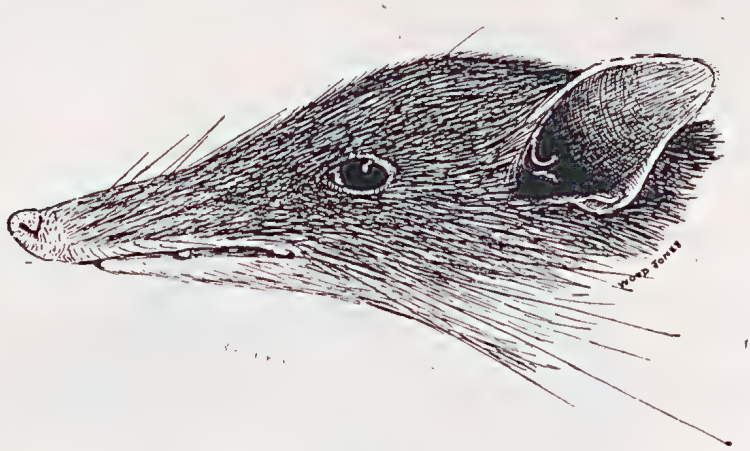

FIGURE 99.—Head of *Perameles nasuta*—the Long-nosed Bandicoot of eastern Australia. Two-thirds natural size.

At first sight it might seem that the name of Short-nosed Bandicoot was inappropriate when applied to the animals belonging to the Genus *Isoodon* The name is, however, well established, and was bestowed as a distinction from the most familiar Bandicoot of the eastern portion of the continent in which the nose is far longer. (*See* Figure 99.) This animal (*Perameles nasuta*) is a member of the next Genus and does not occur in this State.

GENUS 2.—PERAMELES (Geoffrey, 1804).

The members of this Genus are more lightly built and graceful than those of the Genus *Isoodon*. The coat is smooth and fairly soft, the hair being comparatively

FIGURE 100.—The form of auricle characteristic of the members of the genus *Perameles*.

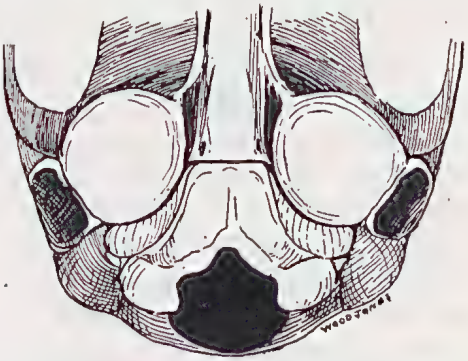

FIGURE 101.—The bulla region of the base of the skull of *Perameles myosura*. Twice natural size.

fine. The muzzle is greatly prolonged, the rhinarium naked and grooved. Ears long, with pointed tips; when laid forward they cover the eye. In texture they are thin and leaf-like. The main processus antihelicis is small; the secondary process elongated and flattened. An elongated bursa and a shallow pre-auricular depression are present. (*See* Figure 100.) The sole of the pes is hairy in its posterior part. Digits and pads as in *Isoodon*.

Dentition, I. $\frac{5-5}{3-3}$. C. $\frac{1-1}{1-1}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{4-4}{4-4}$. Cranium short, nasal region greatly prolonged. Bullae small, round, and complete. (*See* Figure 101.)

Two species inhabit South Australia.

KEY TO THE SOUTH AUSTRALIAN SPECIES.

(A) General colour brownish-grey, boldly banded across the loins with black bars.
P. myosura.

(A[1]) General colour dull orange, no bars across the loins.
P. eremiana.

(1) South Australian Barred Bandicoot.

PERAMELES MYOSURA (Wagner, 1841).

An explanation must be made concerning the nomenclature here employed, and this explanation must embrace both the popular and the scientific name. The animal is often named the "striped" Bandicoot. Throughout this series of volumes the term "stripe" is used only for a longitudinal marking; by stripe a mark elongated in the long axis of body is indicated. Lines which encircle the body, on the other hand, are indicated as bars or bands. In order to retain a consistent nomenclature this animal is therefore termed "barred," and not "striped" Bandicoot. With regard to the scientific name, the animal has long been known as *Perameles bougainvillei*, or as *Perameles bougainvillei fasciata*, but here we revert to an older usage, and *bougainvillei* is reserved as the name for the animal living on Peron's Peninsula, in Shark's Bay.

Perameles myosura is a lightly built, graceful little animal, with slender manus and pes. The muzzle is much prolonged, the ears are large and held erect; the coat is strikingly, almost brilliantly, marked. The general colour is a rather warm, grizzled, brownish-grey. The hair is long, and though each individual hair is spine-like, the coat is soft to the touch. The under fur is grey in colour and is abundant, especially towards the hind end of the body. The muzzle, face, and head finely grizzled fawn; some of the hairs being yellow, and some being black at the tips. The dorsal surface of the anterior portion of the body grizzled grey-brown, becoming darker as it is traced backwards, by reason of more of the hairs being black tipped. This colouration ends in the hinder part of the costal region, and is succeeded by a paler band of pure fawn, which in turn is followed, in the

mid dorsal line, by a black area over the loins. From this black area three black bars emerge and radiate downwards over the sides of the body. The first bar, which is the most conspicuous, descends to the front of the thigh ; the second to the middle of the thigh ; and the third to the back of the thigh. The intervals between these bars is pure, or slightly grizzled fawn, considerably lighter than the colour of the anterior portion of the body. The posterior portion of the body is thus marked by alternate bars, which are respectively lighter and darker than the general colour of the anterior portion of the body. The fact that this portion is uniformly coloured, and is darker than the light bars of the posterior portion, led Gould to give the name of " Saddle-backed Bandicoot " to the Western Australian form. In the South Australian animal, the saddle is inconspicuous, and the dark and light bars are the outstanding features of the pattern. (*See* Figure 102.) The boldly marked South Australian form has been given a separate sub-specific name,

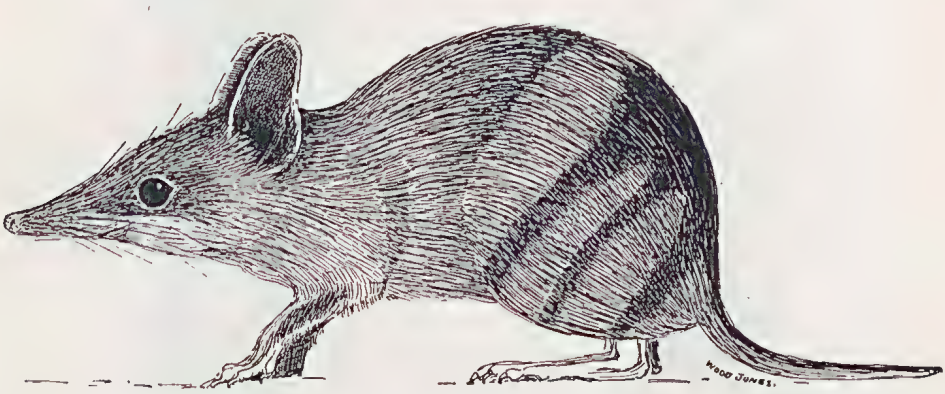

FIGURE 102.—*Perameles myosura*. South Australian specimen of the type *notina* from Ooldea. Half natural size.

P. myosura notina (Thomas, 1922), to distinguish it from the Western Australian animal in which the dark bands are indistinct and incomplete. The outer side of the limbs is smoky-grey, the fawn colour being conspicuously absent on the outer side of the ulnar region of the forearm, and the fibular region of the leg, which are clothed mostly by the under-fur. The under surface of the chin, throat, and body, and the inner surface of the limbs, pure white. Dorsal surface of manus and pes white. Hair on sole of pes dusky, and hair on under side of wrist dark grey. Tail fairly long, finely taper and clothed with fine hairs. The tail is distinctly parti-coloured, being dark grizzle in the dorsal third of its circumference and white in the ventral two-thirds.

The ears are large, broadened at the base and tapering towards their oval tips. In texture they are thin and membranous. Clothed with minute hairs without ; the anterior portion of the base being rather bright fawn brown, the central portion dark, and the hinder portion dusky and almost naked. Within are sparse white hairs around the margins ; the central portion is naked and pinkish-grey in the living animal ; the naked portion is punctate with little depressions about the size of a small pin's head. The processus antihelicis is thin and pointed towards its tip, being roughly triangular in shape. The secondary process is elongated laterally. An elongated bursa and a shallow preauricular depression are present.

The eye is black and is fringed by fine black eyelashes. The rhinarium is naked and flesh coloured; it is strongly grooved below. The nostrils are cleft laterally.

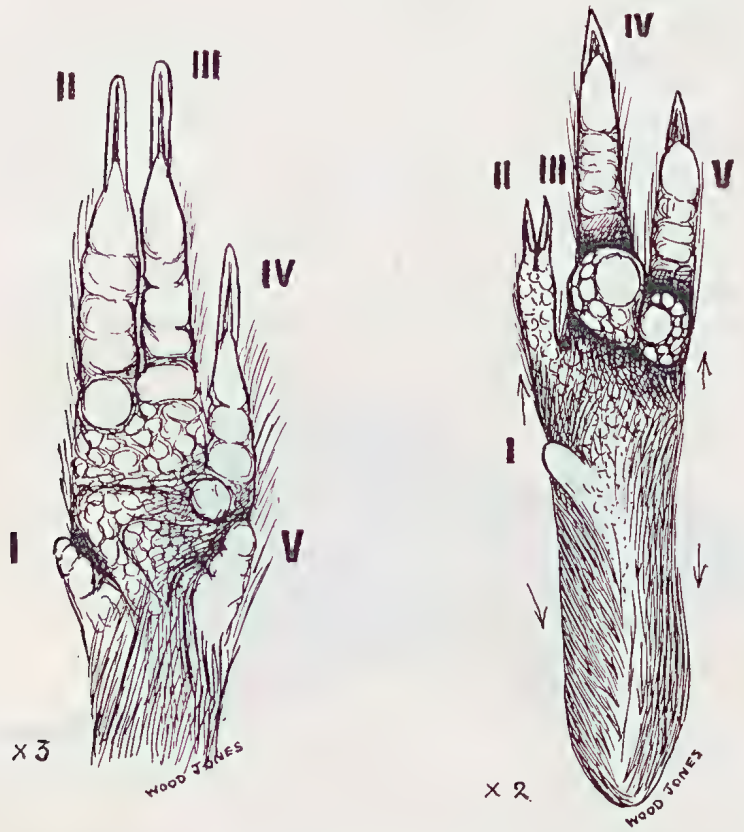

FIGURE 103.—Left manus and pes of *Perameles myosura*. Manus three times, pes twice natural size.

All vibrissae are well developed. The mysticial set is in five rows; the individual hairs are dark in the upper rows and light in the lower ones; the longest bristle exceeding 40 mm. The genal set contains mixed light and dark bristles. The supraorbitals are dark, the genals and submentals white. The ulnar carpal tuft is well developed; the longest bristle in the set being 40 mm.; these vibrissae are all pure white.

FIGURE 104.—Marsupium and nipples of *Perameles myosura*. Natural size.

The manus has a naked granular palm. The pads are not well defined and are situated at the bases of digits 2, 3, and 4. The first digit is rudimentary, the second and third elongated and strongly clawed, the fourth short but clawed, and the fifth much reduced and having no claw. The digits are fusiform, there are no well developed apical pads. The digital formula is $3 > 2 > 4 > 5 > 1$. (*See* Figure 103.) The sole of the pes is granular, and from the heel to the bases of the

interdigital pads, is clothed with short, dusky, hairs in the central area, and longer white hairs along the margins. At the level of the first digit there is a well marked hair parting, the hairs in front of this line having their free tips directed forwards towards the toes, and the hairs behind it having their tips directed backwards towards the heel. Two well marked pads are present at the bases of the large fourth and fifth digits. The first digit is rudimentary, the second and third are syndactylous, the fourth is very large and carries a strong nail, the fifth though smaller is also armed with a well developed nail. The digital formula is $4 > 5 > 2{\cdot}3 > 1$.

The pouch opens downwards and backwards. The nipples are 8 in number, arranged in a circle which is open in front. (*See* Figure 104.)

The skull is elongated and delicately built. (*See* Figure 105.)

DIMENSIONS.

	Type of Sub-species *notina* (Thos)	♀	♀	♂	♀
Head and body	280	240	215	208	205
Tail	90	85	78	75	75
Hind foot	56	51	47	47	45
Ear	—	42	38	37	35

The type specimen is described as from "plains near the head of St. Vincent Gulf," collected by Capt. Sir George Grey, and by him presented to the British Museum. The other specimens of which measurements are given are from Ooldea, and for all of them I am indebted to Mr. A. G. Bolam.

DIMENSIONS OF SKULL.

	Type of Sub-species *notina* (Thos)	Ooldea.		
		♂	♀	♂
Basal length	66	63	53	53
Breadth	—	27	24	23
Nasals, length	29	27	23	23
Palate length	—	40	33	33

Judging by the specimens enumerated in the British Museum Catalogue of 1888, this beautiful little Bandicoot had at one time a fairly wide distribution in this State. In addition to the animals from the head of St. Vincent Gulf, are others

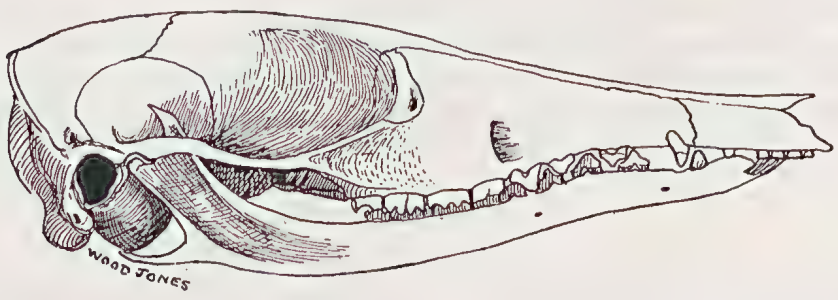

FIGURE 105.—Skull of *Perameles myosura*. One and a half times natural size.

from the River Murray in South Australia, and from Adelaide itself. As far as can be ascertained it has now disappeared from all these localities, and remains only in the wastes of the western portion of the Centre. Its present habitat is the open plains, the level stretches of which are broken only by sandhills and outcrops of limestone; and for vegetation, the blue bush (*Kochia sedifolia*), the salt bush (*Atriplex vesicarium*), and the various stunted desert acacias. On the plains it makes a nest, under a salt bush, similar to those of the Short-nosed Bandicoots, save that it is more given to excavating hollows in which to accumulate its nesting materials. It is mainly insectivorous in diet, and crepuscular or nocturnal in it habits. It is an animal of astonishing activity, its powers of jumping being all the more remarkable from its habit of rising vertically into the air. When alarmed on its evening excursions it will pause, and then, in an instant, spring into the air and vanish in the most remarkable manner. It has few rivals in its ability for disappearing. One moment it is full in view and motionless, and the next it is gone completely. Although the marking of its coat is so boldly contrasted as to create the impression that it would be a rather conspicuous creature, it is, as a matter of fact, one of the most elusive animals and one of the most difficult to detect. When fully active in the twilight its movements are more reminiscent of those of birds than those we usually associate with mammals.

Barred Bandicoots become very tame and familiar in captivity, but although they are extremely gentle when kept as pets, they are desperately pugnacious among themselves. On one occasion eight live specimens were sent from Ooldea. All eight were dead and almost devoid of hair when they arrived in Adelaide. They had fought each other to the death on the railway journey. But among the corpses were four pouch young, which were uninjured. Two of these were males and two were females, the males being one litter and the females another. These little animals were cold and apparently dead; but they were carefully warmed up and given artificial respiration, and in the end they all recovered. The males were reared separately from the females. As they grew older, one female killed the other and one male bit the tail off his fellow. It was hoped to breed from this stock, so, when they were nearly a year old, the remaining female was placed in a run with one of the males. She was rescued almost hairless, and was with difficulty nursed back to life. When she was completely recovered she was placed with the other male, and in the morning he was almost plucked of his hair and, despite careful treatment, died of his wounds two days afterwards. Subsequently this female bred freely with the first male, but always evinced a strong tendency to kill and eat her progeny, even when they were grown to half their adult size. As in the case of *Isoodon*, the fighting is done largely with the long claws of the hind feet; and if the animal is annoyed it will jump at an intruding hand and inflict a sharp scratch with its claws very much in the manner of a game cock. The breeding season is in May and June, and two young are usually born at a time, but I have come across one litter of three.

(2) **Desert Bandicoot.**

PERAMELES EREMIANA (Spencer, 1897).

Size medium; proportions slender. Fur soft with numerous long, dark, spiny hairs on the dorsal surface of the head and body; continued as two dark bands

down each side of the rump. General colour of upper surface dull orange. Margin of upper jaw and under surface of head, together with the whole under surface of the body, white. An orange patch on the shoulders. A patch of dark-grey under-fur on the outer side of the arm and forearm, the rest of the front limb being white. An orange patch on the rump between the two lines of long, black, spiny hairs where the latter are absent. A patch of grey under-fur on the outer side of the hind limb at the lower end of the hinder line of long black hairs. The inner side of hind limb and upper surface of foot white.

Long hairs white at their base, the flattened out part and fine tip being black. Under-fur on the back grey basally, with a white median part and an orange extremity. On the sides of the body the grey is wanting, and on the under surface chin, etc., the orange is also absent. Muzzle fairly long and slender. Ears very long, narrow, and pointed, laid forward they reach 17 mm. beyond the anterior canthus of the eye, grey behind, with a brownish patch anteriorly. Processus antihelicis about as broad as long with a rounded end. A few long, white, whisker-like hairs just above the wrist, the longest measuring 58 mm.

Soles of the hind feet covered with dark-brown hairs up to the pads at the base of the fourth or fifth toes. Tail distinctly bicolour for its whole length ; the upper surface with black (or very dark-brown) spiny hairs sharply marked off from the white hairs of the under surface and side. Nipples eight.

DIMENSIONS.

	♂	♀
Head and body	235	275
Tail	118	135
Hind foot	50·2	55
Ear	51	51

DIMENSIONS OF SKULL.

	♀
Basal length	55·5
Breadth	24
Nasals, length	24
Palate length	36

The above description and measurements are taken from the original description by Sir Baldwin Spencer. In the original, the length of the palate is given as 3·6 mm., but this is an obvious error for 36 mm., and in this respect, therefore, the description has been altered. The original specimens came from Burt Plain, north of Alice Springs, and sandhills about forty miles to the north-east of Charlotte Waters. I know no other records of its capture. Its habits appear to be similar to those of *Perameles myosura ;* it builds a nest in a hollow, scooped out in the sand, and appears to produce two young.

Genus 3, PERORYCTES (Thomas, 1906), Genus 4, ECHYMYPERA (Lesson, 1842), and Genus 5, SUILLOMELES (Allen & Barbour, 1909), are confined to New Guinea and the neighbouring islands, and do not inhabit continental Australia.

Genus 6.—THALACOMYS (Blyth, 1840).

Size larger than that of the members of the preceding Genera. General form light and delicate. (*See* Figure 106.) The pelage is remarkably long and silky. The muzzle is long and pointed and, as a rule, is naked upon its dorsal surface for some distance behind the rhinarium. The rhinarium is narrow, naked, and

Figure 106.—The general characters of a Bilby. An adult male specimen of *Thalacomys nigripes*, about one-third natural size. The end of the tail is represented erect merely for the purpose of compactness of illustration.

grooved only slightly upon its infra-narial portion. The nostrils are slit like. The ears are extremely long, naked, and membranous towards their extremities; the tubular funnel-shaped basal portion being hairy. (*See* Figure 107.) The processus antihelicis duplicated. The pouch opens downwards and slightly backwards. Nipples eight in number, arranged in two crescentic rows. The hind limb considerably longer than the fore limb. The manus with five digits: the first and

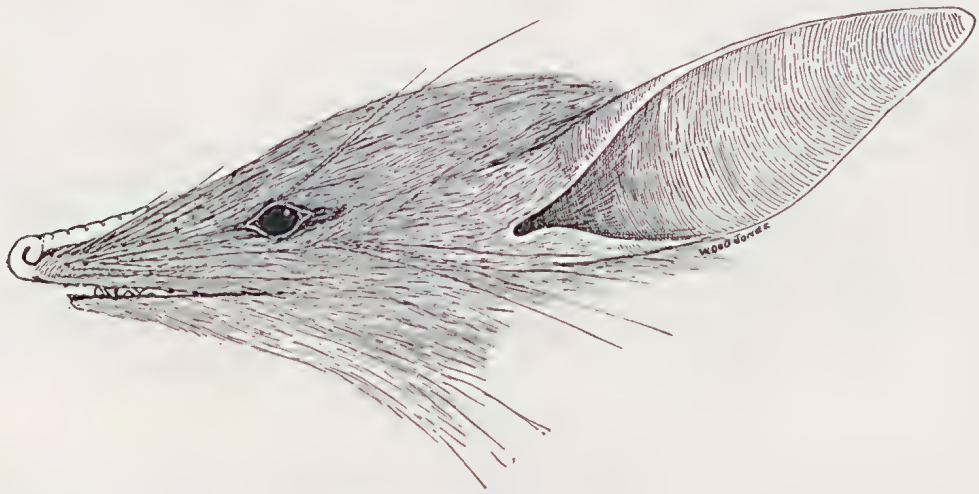

Figure 107.—The characters of the head of a Bilby. Drawn from a living male specimen of *T. nigripes*. Half natural size.

fifth short and clawless, the second, third, and fourth well developed and armed with strong curved claws. The pes with only four digits, the hallux being absent. The second and third digits are syndactylous, the fourth and fifth are well developed and strongly clawed, the fourth being by far the longest. (*See* Figure 108.) The digital formula of the manus is $3 > 2 > 4 > 5 > 1$. The palm is granular, with three small interdigital pads at the bases of the second, third, and fourth digits. The digital formula of the pes is $4 > 5 > 2{\cdot}3$. The sole is hairy with the exception of the heel, pad, and terminal portions of the digits. There is one large pad at the

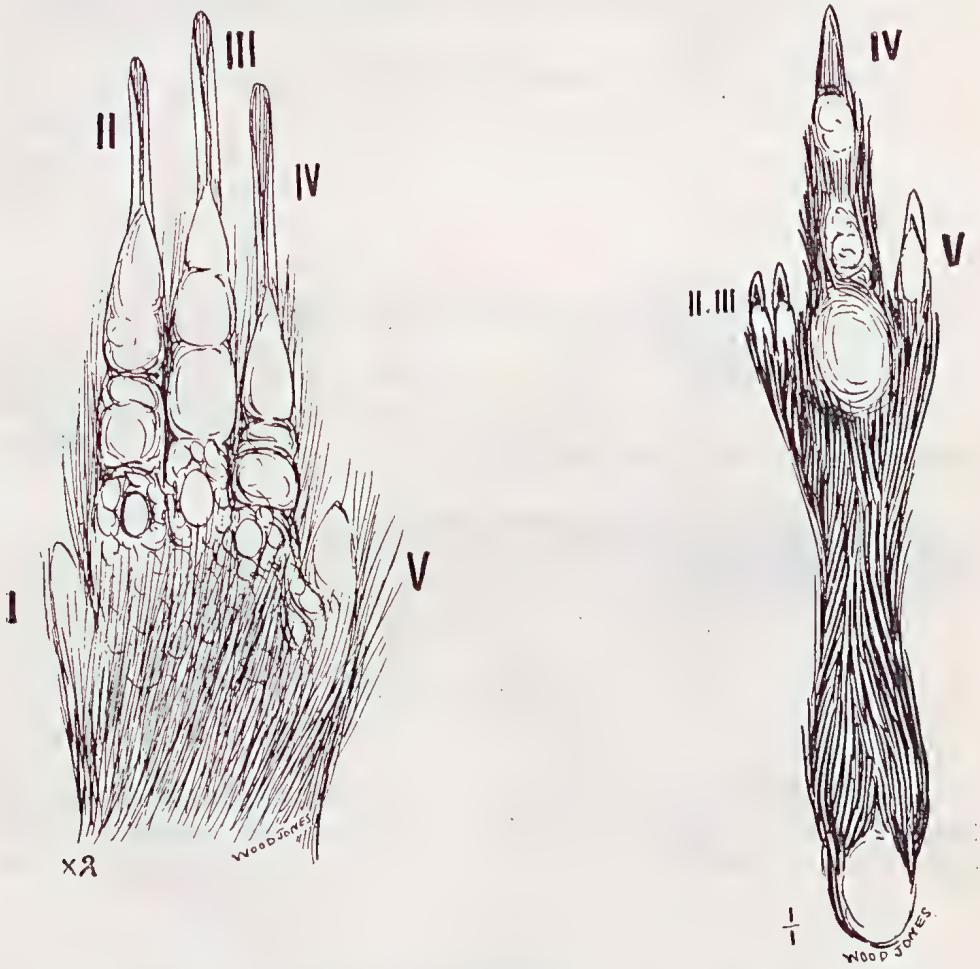

FIGURE 108.—Left manus and pes of *Thalacomys nigripes*. Manus twice natural size, pes natural size.

base of the fourth digit. The tail is long and conspicuously crested in its terminal portion, the actual tip of the tail being naked and hardened into the form of a little spur. (*See* Figure 109.) The facial portion of the skull is abruptly contracted to the snout region opposite the second premolar. The dentition is I. $\frac{5-5}{3-3}$. C. $\frac{1-1}{1-1}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{4-4}{4-4}$. The bullae are large and markedly pyriform. (*See* Figure 111.) There are only five members of this interesting Genus, and all are (or were) inhabitants of South Australia. In habits they seem to be very similar, and, therefore, it is best to give a general account of their economy after the individual species have been distinguished and described.

KEY TO THE SPECIES.

(A) The tail particoloured black and white.

(B) The black portion as long as, or longer, than the white portion.

(C) Size large. Head and body length 400 mm. and upwards. *T. lagotis.*

(C¹) Size small. Head and body length 200 mm. and upwards. *T. minor.*

(B¹) The black portion shorter than the white portion.

(D) Pes white above. *T. sagitta.*

(D¹) Pes black above. *T. nigripes.*

(A¹) Tail wholly white. *T. leucurus.*

(1) Rabbit Bandicoot, Pinkie or Bilby.

THALACOMYS LAGOTIS (Reid, 1836).

This is the animal which, in books, is usually termed the Common Rabbit-Bandicoot, but it would be most misleading to apply the term "common"

FIGURE 109.—Terminal portion of the tail of *Thalacomys nigripes* to show the naked spur-like tip.

to it to-day. It is considerably the largest member of its Genus, and might, therefore, pass as the Larger Rabbit-Bandicoot or Larger Pilby; but, since it is the only one that has ever had a familiar name bestowed upon it, it is perhaps best

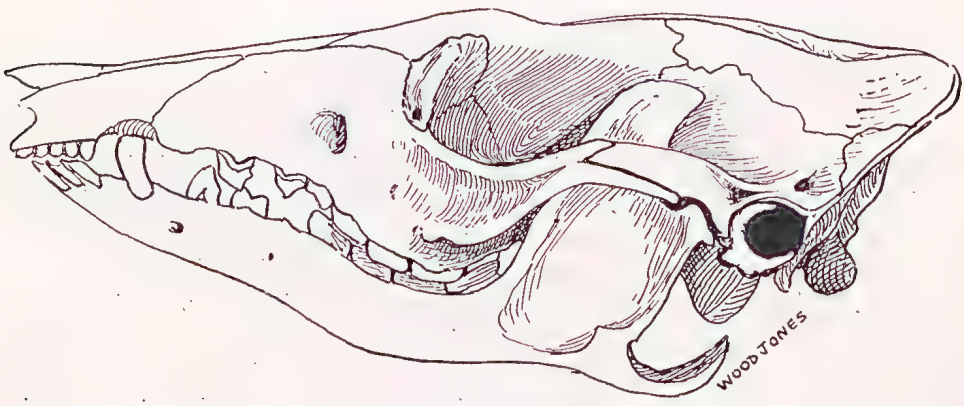

FIGURE 110.—Lateral view of the skull of *Thalacomys lagotis*, from a South Australian specimen. Natural size.

to leave it in possession of the unmodified name, and to distinguish the other members of the Genus from it.

The size is large, the head and body length being 400 mm. and upwards. Fur very long, soft and silky. General colour a delicate smoky grey, being more fawn-grey immediately after the moult. The coat almost wholly composed of under-fur, only a few longer hairs, mostly along the mid-line of the back, being mixed with it. Muzzle greatly elongated. Rhinarium flesh-coloured, with the naked pink area extending backwards for 20 mm. along the dorsal surface of the snout. Face fawn-grey, the hair being considerably shorter than the hairs of the body. Cheeks and bases of the ears pale. Chin, throat, ventral surface of the body and inner aspect of the limbs pure white. Outer aspect of limbs grey. A faint indication of bars across the thigh is present in some specimens. The manus is white, the actual digits being at times brownish. The pes is white above; below it is black in its posterior half or rather more. The tail is particoloured black and white, and boldly crested on its dorsal surface. The basal third is clothed with the general body fur; the middle third, or rather more, is black, the hairs being coarse and hispid; the terminal portion (shorter than the black portion) is strongly crested with pure white hairs. The ears are extremely long, nearly naked; their edges finely fringed, and the anterior part of their backs clothed with pale-brown hairs. The eye is black, and is fringed with fine black eyelashes. All facial vibrissae are well developed. The palm and sole, and the digital formula for manus and pes, as described for the Genus. The pouch opens downwards and backwards. The species was originally described as having nine nipples, but eight is the more usual number. The skull is large, basal length being 90 mm. or more. All muscular ridges and crests extremely well marked. (*See* Figure 110.) The posterior (molar) portion of the palate distinctly rounded in outline. (*See* Figures 111 and 112.) The large molars arranged in a crescentic series. The posterior margin of the palate extending well behind the last molar teeth. The posterior palatine vacuities reach from about the central point of the middle premolar to about the central point of the third molar. The nasal bones extend backwards so that their posterior ends almost reach a line joining the lachrymal foramina. (*See* Figure 113.)

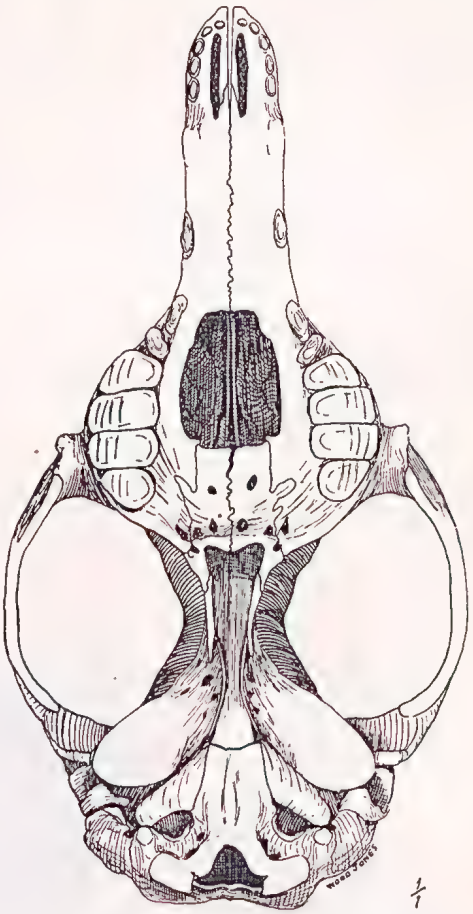

FIGURE 111.—Basal view of the skull of *Thalacomys lagotis*, from a South Australian specimen. Natural size.

DIMENSIONS.

	♂ Nalpa, S.A., Stuffed.	Type ♀ Reid.	Brit. Mus. ♂ Stuffed, W.A.
Head and body	550	462	440
Tail	260	254	220
Hind foot	114	113	98
Ear	77	97	90

DIMENSIONS OF SKULL.

	Nalpa.	Nalpa.	Nalpa.	Gilles Plains.	W.A.	W.A.	W.A.
Basal length	105	104	103	96	94	94	92
Breadth	55	56	55	55	44	50	42
Nasals, length	47	48	50	49	47	47	46
Palate length	66	66	64·5	64	62	61·5	61
C—M^4	43	44	45	43	45	44	42·5

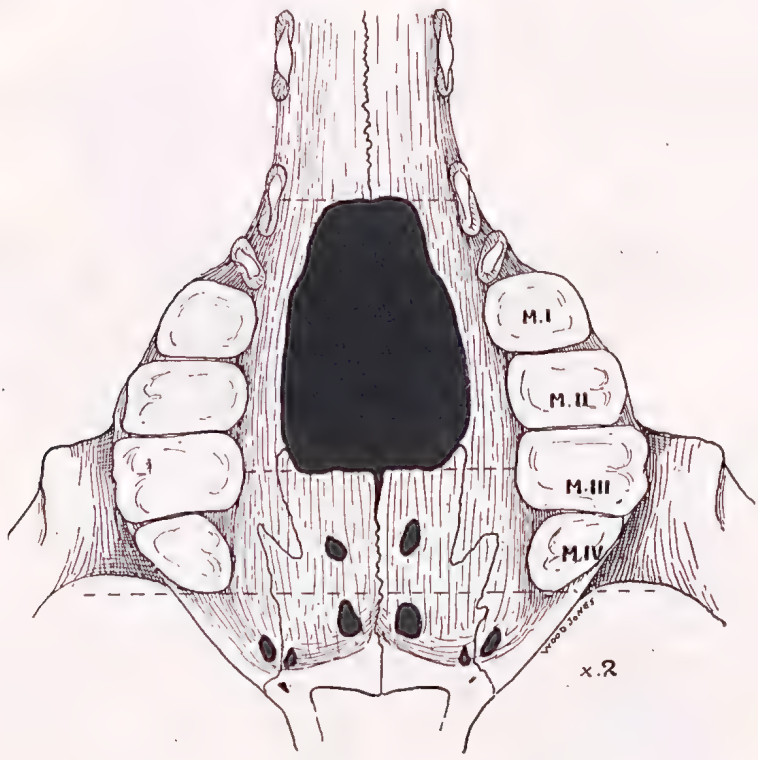

FIGURE 112.—Posterior end of palate and molar teeth of *Thalacomys lagotis*. Twice natural size.

Thalacomys lagotis, though formerly abundant in South Australia, is now either extinct or on the verge of extinction. It was the familiar species of Bilby in the

more fertile portions of South Australia only a comparatively short time ago. Not more than thirty years since it was usual for rabbit trappers, even in the immediate neighbourhood of Adelaide, to take more Bilbies of this type than rabbits in their traps. This race, which is similar to that which still exists in Western Australia, apparently had its last South Australian stronghold at Nalpa and in the wide tract of country about Lake Alexandrina; but from Nalpa it has long since disappeared, and it seems most probable that the animal is now extinct in this State.

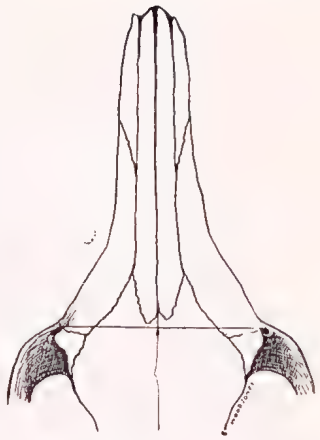

FIGURE 113.—Muzzle of *Thalacomys lagotis* to show the posterior ends of the nasal bones.

(2) Lesser Bilby.

THALACOMYS MINOR (Spencer, 1897).

In outward appearance this animal may be described as being like *T. lagotis*, but slightly darker and considerably smaller, the head and body length being only 200 mm. and upwards. The description of the type specimen is as follows:— Size considerably smaller than *lagotis*. Fur very long, soft and silky; composed almost entirely of under-fur. General colour fawn-grey, but darker than in *lagotis*. Head long, muzzle narrow. Rhinarium naked at the tip of the snout, but no backward prolongation of the naked part as in *lagotis*. Face grey-brown, the under-fur of the face grey basally, then fawn coloured with a dark tip, the longer hairs with a longer black tip. On the dorsal surface and sides of the body the under-fur is black basally, then fawn coloured. The longer hairs very little longer than the under-fur, with a black tip. The hairs of the under-fur very often have a dark-brown tip. Chin and inner surface of fore limbs white, the rest of the limbs and under-surface grey, the fur with dark-grey basal part and white distal half. Manus white. Pes white above, hairy beneath, the hairs on the posterior two-thirds black, the anterior third white. Tail with the proximal two-thirds short-haired. Along thedorsal line is a sharply marked narrow band of dark hair increasing in length distally. At one-third of the length

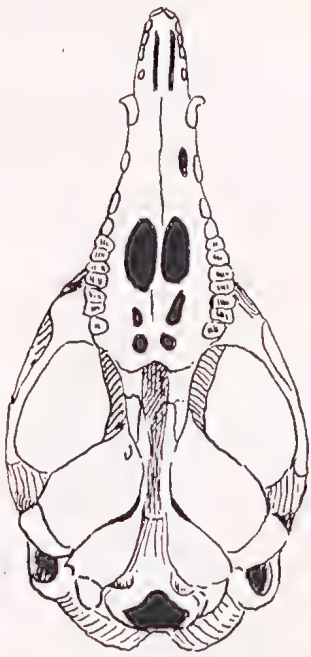

FIGURE 114.—*Thalacomys minor*. Spencer. Basal view of skull. After Baldwin Spencer, Proc. Roy. Soc. Vict. Vol. IX. (N.S.). Plate II., Fig. 2. Natural size.

from the posterior end the black hairs stop abruptly and are succeeded by a dorsal series of white hairs forming a distinct crest, the hairs of which are proportionately shorter than in *lagotis*. Sides and under surface of tail with scanty stiff white hairs (the black dorsal area of the tail measuring 93 mm., the white terminal portion 67 mm.). Palms and soles, and digital formula of manus and pes, as described for the Genus. The typical eight nipples are present.

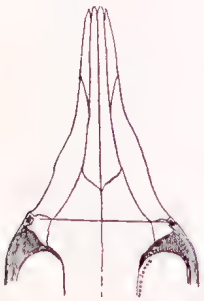

FIGURE 115.—Muzzle of *Thalacomys minor* to show the posterior ends of the nasal bones.

The skull is small and delicate, basal length being 60 mm. or more. Muscular ridges and crests are very feebly developed. (*See* Figure 114.) The posterior portion of the palate slightly rounded, the small molars being in slightly curved rows. The posterior margin of the palate extends well behind the last molar tooth. The posterior palatine vacuities reach from about the central point of the middle premolar to the back of the second molar. The nasal bones extend backwards so that their posterior ends fall short of the line joining the lachrymal foramina by about 5 mm. (*See* Figure 115.)

DIMENSIONS.

	Adult ♀	Adult ♀	Adult ♂	Adult ♀	Adult ♂
Head and body	215	200	245	240	270
Tail	124	118	127	152	160
Hind foot	58·5	57	65	62	73
Ear	71	68	87	85	92

DIMENSIONS OF SKULL.

	♂
Basal length	66
Breadth	34
Nasals, length	32
Palate length	41
C—M^4	28

The description and measurements are taken from the original account by Sir Baldwin Spencer. The measurements of the tail have been added as a result of the kindness of Mr. James Kershaw, who supplied these details from a re-examination of the type specimen. The animal was taken in the sandhills about forty miles to the north-east of Charlotte Waters, but its range almost certainly extends southwards into South Australia.

(3) Barcoo Bilby.

THALACOMYS SAGITTA (Thomas, 1905).

This Bilby, which is the representative of the Genus in the wide area of the Centre that may be described as the Lake Eyre basin, was first made known to science from the mission station at Killalpaninna on the Barcoo or Cooper's Creek.

FIGURE 116.—Lateral view of the skull of *Thalacomys sagitta*. Natural size.

It is intermediate in size between *lagotis* and *minor*; the head and body length being 300 mm. and upwards. In general external characters it is very like *lagotis*, from which it differs only in certain minor, but constant, details. The general body colour is a little paler than is usual in *lagotis*. The manus is white. The pes is white above, but it is dark below in only its posterior third. The white terminal portion of the tail is longer than the black portion. The other external characters are as described for *lagotis*. The skull is fairly large, the basal length being 70 mm. or more. (*See* Figure 116.) The muscular crests are not particularly well developed. The posterior portion of the palate is only very slightly rounded in outline; the molars are arranged in almost straight rows which diverge posteriorly. (*See* Figures 117 and 118.) The posterior margin of

FIGURE 117.—Basal view of the skull of *Thalacomys sagitta*. Natural size.

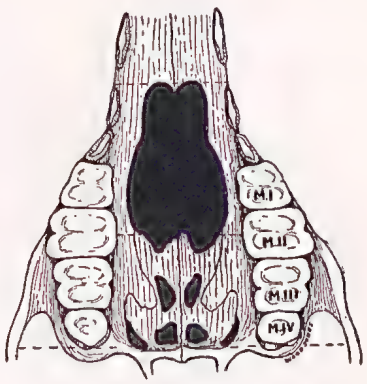

FIGURE 118.—Posterior end of the palate and molar teeth of *Thalacomys sagitta*.

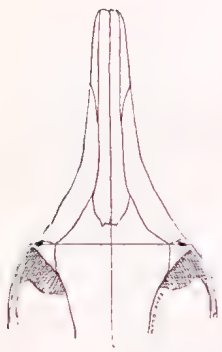

FIGURE 119.—Muzzle of *Thalacomys sagitta* to show the posterior ends of the nasal bones.

the palate terminates at the last molar tooth. The posterior palatine vacuities reach from about the central point of the middle premolar to about the central point of the second molar. The nasal bones extend backwards so that their posterior ends come to within about 4 mm. of the line joining the lachrymal foramina. (*See* Figure 119.)

This Bilby is a northern form living in the region of the great drainage system of Lake Eyre. It is probable that it is still fairly abundant in those portions of this region where foxes have not yet become plentiful, and where it can still compete with rabbits for nesting burrows.

DIMENSIONS.

	Adult ♂ Type Measured by Mr. Hillier.
Head and body	316
Tail	215
Hind foot	91
Ear	·79

DIMENSIONS OF SKULL.

	Type.	Coward Springs.
Basal length	76·5	—
Breadth	38	35
Nasals, length	40	37
Palate length	50	49
C—M^4	36	36

(4) **Black-footed Bilby.**

THALACOMYS NIGRIPES (Wood Jones, 1923).

This Bilby is almost the same size as *sagitta*, and, therefore, smaller than *lagotis* and larger than *minor*. It is distinguished from all other members of the Genus by its black manus and pes. In general colour it is much as *lagotis*, being darker and more fawn coloured immediately after the moult, and lighter and more silvery immediately before it. The general body colour becomes darker upon the dorsal surface towards the hind end of the body, the tips of the long hairs of the posterior end of the body being black. At the immediate base of the tail, the dark hairs give way to rather bright fawn coloured ones over a distance of about 30 mm. The naked rhinarium is flesh coloured, grooved on its labial portion, and extending backwards dorsally for about 20 mm. Face fawn coloured. The dorsal area of

the snout immediately behind the naked portion, and as far back as the middle of the eye, is black. Fine black hairs also surround the eye. Sides of the body more fawn coloured than the dorsal surface. Chin, throat, and ventral surface pure white. The hair is directed uniformly backwards on the body, save that there is

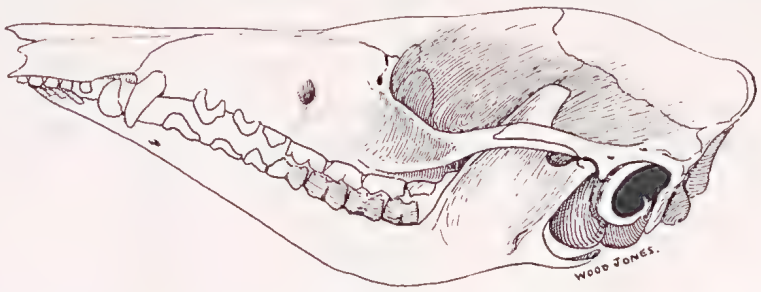

FIGURE 120.—Lateral view of the skull of *Thalacomys nigripes*. Natural size.

a reversed gular tract as in the Bandicoots. Fore limb dark as a whole on its outer and upper aspects, white on the inner side and below. The proximal (humeral) portion dark-grey, increasingly dark as it is traced downwards; the fore arm, wrist, and dorsum of the manus black. The black hair stops abruptly over the metacarpus, the digits themselves being white. Just above the wrist, the white of the inner aspect of the fore arm trespasses on to the dorsal surface, making a prominent white patch, about 15 mm. in diameter, on the lower part of the fore arm. The hind limb grey in the whole of its diameter in the tibial portion, save for a narrow strip of white on the dorsal aspect. From the ankle onwards the pes is entirely black, both above and below, save for the presence of a few white hairs over a space of about 5 mm. at the base of the nail of the elongated fourth digit. The base of the tail is fawn colored, the basal area being succeeded by a portion 75 mm. in length, clothed with coarse black hairs, followed by a terminal portion, 85 mm. long, clothed with coarse white hairs which form a conspicuous crest. The terminal dorsal crest projects 40 mm. beyond the tip of the tail. The tail itself ends in a curious hardened spur. (*See* Figure 109.) The ears are enormously long, the auricle consisting of two distinct portions, the basal, tubular, portion clothed in the whole of its circumference with fawn coloured hairs like those of the head and face; this portion measures 25 mm. The terminal leaf-like portion is almost entirely naked, extremely thin, dark-grey in colour, and shining. In the living animal the blood vessels are conspicuous, and, as in some of the Bandicoots, the leaf-like portion of the auricle is punctate with little circular pits about 1 mm. in diameter.

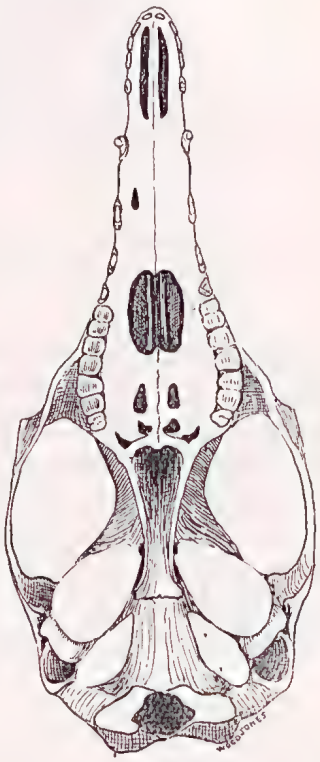

FIGURE 121.—Basal view of the skull of *Thalacomys nigripes*. Natural size.

The naked portion of the ear is 90 mm. in length. The eye is black. The mysticial vibrissae are arranged in five rows, the upper and longer bristles being black, the lower and shorter ones white. The longest measures 50 mm. There are two black supraorbital vibrissae, the one is long (45 mm.) and the other only about half that length. The genal set is represented by a tuft of six vibrissae, of which some are black and some are white; the longest measures 60 mm. The ulnar carpal set is well developed, and consists of three or more strong white bristles, of which the longest is 40 mm. The pouch is well developed, it extends further in front of the opening than it does behind. The nipples are eight in number. The skull is, in its general characters, much as in *sagitta*, but from that form it is very readily distinguished in several details. (*See* Figure 120.) The muscular ridges are but little marked, the skull is lightly built, and the muzzle is extremely elongated and narrow. The posterior ends of the nasal bones are separated from

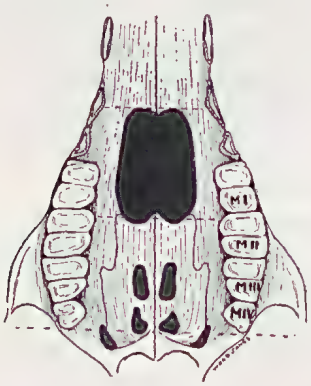

FIGURE 122.—Posterior end of palate and molar teeth of *Thalacomys nigripes*.

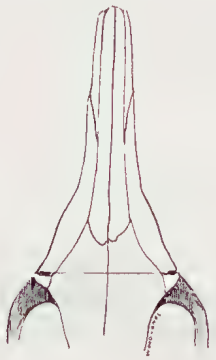

FIGURE 123.—Muzzle of *Thalacomys nigripes* to show posterior ends of nasal bones.

the line joining the two lachrymal foramina by an interval of 5 mm. (*See* Figure 123.) The palate is greatly elongated and extends for a distance of 3 mm. behind the last molar teeth. The posterior portion of the palate is slightly rounded, the molars being arranged in two slightly crescentic rows. (*See* Figures 121 and 122.) The posterior palatine vacuities are peculiarly small, and they extend from the mid point of the middle premolar only to the anterior margin of the second molar. The small size of these vacuities constitutes a very striking, and very constant, distinction of the species. The teeth are small, the molars in particular being considerably smaller than those of *sagitta*.

DIMENSIONS.

	Type ♂.	♂	♂
Head and body	390	365	320
Tail	200	220	210
Hind foot	98	96	92
Ear	105—90	110—97	103—90

Two measurements are given for the ear, the first being the dorsal and the second the ventral measurement.

DIMENSIONS OF SKULL.

	Type ♂.	♂
Basal length	81	80
Breadth	35	32
Nasals, length	40	33
Palate length	50	48
C—M⁴	37	34·5

This animal is, so far, only known from the district round Ooldea Soak, on the railway from Port Augusta to Perth. In that district it appears to be by no means uncommon. As with some other members of the *Peramelidae*, there seems to be a great preponderance of males. Its actual area of distribution cannot be determined without careful collecting in the great western spaces of the Centre.

The animal was made known to science through the enthusiastic researches of Mr. A. G. Bolam, of Ooldea, to which gentleman South Australian science is indebted for his efforts in preserving specimens of a vanishing fauna.

(5) White-tailed Bilby.

THALACOMYS LEUCURUS (Thomas, 1887).

This animal is known only from a single specimen which is not adult. Despite the unsatisfactory nature of the material, there can be no doubt that this is a very distinct and very striking form of Rabbit-Bandicoot.

Size small, form slender. Fur long, soft, and silky. General colour pale yellowish fawn. Head long, muzzle narrow; naked rhinarium confined to the extreme tip of the snout, and not extending backwards along the top of the muzzle. Ears when laid forward reaching beyond the tip of the muzzle, evenly clothed with fine silvery hairs, which form a delicate fringe round their edges; their substance yellowish flesh-colour, except for their posterior half distally, where it is slate-grey. Processus antihelicis large, oblong, its edges slightly concave, its tip broadly rounded, hairy; the long secondary lower fold also with a small trianular projection at its centre. Top of head and back fawn, suffused with slaty-grey, the hairs slate coloured at their bases and tipped with brown. Chin, chest, sides, and belly pure white. Limbs wholly white throughout. Palms hairy on their centres, and fringed round their edges, naked only along the undersides of the toes and on the pads; there is a single well-defined circular pad at the bases of each of the second, third, fourth, and fifth fingers, and another below the middle phalanx of the second, third, and fourth. Soles similarly hairy and fringed, only naked on the compound terminal projection, on which there are two small round pads, and on the underside of the fourth and fifth toes. Tail about as long as the body without the head, wholly white, slender, tapering, short-haired except along its terminal third above, where a prominent white crest is formed, of which some of the hairs attain to about one inch in length. Skull small and delicate.

DIMENSIONS.

	Type a very young ♂.
Head and body	142
Tail	116
Hind foot	55
Ear	63

DIMENSIONS OF SKULL.

Basal length	45
Breadth	22·5
Nasals, length	18
Palate length	27·7
C—M^4	—

The only specimen which has ever been examined was sent in 1887 by Mr. Beazley (who was at that time taxidermist in the South Australian Museum) to the British Museum. The above description is taken from Oldfield Thomas's account of this unique specimen. Although the precise locality from which this example came is not recorded, it was probably the northern part of this State.

In South Australia the members of the Genus *Thalacomys* were usually known as Pinkies, or in some districts as Pintoes. It is said that the name Pinkie was given to them in allusion to the naked flesh-coloured region of the snout; but the name is also used to designate the Short-nosed Bandicoot in certain parts of South Australia. In the Centre, Rabbit Bandicoots are commonly known as Thulkas, or Talkies, which is the white man's rendering of the name in general use among the Kukata blacks. Further into Western Australia the name changes to Dalgheites, Dalgites, or Dulgites. All these names are, however, somewhat local in their usage. The most general name by which the animals seem to have been known to the colonists in all States is Bilby. Special native names have been applied to the different species. Urpila is the name used by the Charlotte Waters blacks for *T. minor;* the Diari name for *T. sagitta* is Kapita, while Urgata is the name given to the same animal at Charlotte Waters.

In general, the bionomics of all the species may be taken as being similar, and in the following notes the individual species will not be separately mentioned unless it is known that their habits differ in some respects. Observations on wild specimens mostly relate to *T. sagitta*, whilst those observed in captivity have been T. *lagotis* and *T. nigripes*.

By the early colonists the Bilby was not only regarded as an animal against which the methods of the exterminator need not be employed; it was even accorded a certain amount of protection, and was at times kept as a pet about the house. The tolerance with which it was regarded by people whose hands may be justly said to have been against all animals was due to the fact that it was recognised that, in the destruction of mice and insects, it played an extremely useful part. Unfortunately this regard for the Bilby seems to have been forgotten by a later

generation, and in more recent days but little mercy has been shown to them by any section of the community.

The diet is commonly said to be " bulbous roots " (Krefft), " grass, fruits, and insects " (Lydekker) ; but I doubt very much if any of the species is at all given to eating roots, grass, or fruits. It is true that in districts where they live it is common to see little holes scratched around the roots of vegetation, but it is very doubtful if these are made in order to obtain roots. It seems much more likely that insects are the object of the search. In captivity I have been unable to persuade them to eat roots or fruit ; but bread or cake, meat (raw or cooked), insects, snails, birds, and mice are all readily eaten.

The members of the Genus *Thalacomys* differ from the rest of the *Peramelidae* in their truly fossorial mode of life. *Isoodon* and *Perameles* will scratch out shallow runways, but none of the species with which I am acquainted ever excavates real burrows in which to live. *Thalacomys*, on the other hand, passes most of its time in the depths of a burrow of its own making. These burrows are still to be seen in some numbers in certain districts on the route of the Transcontinental Railway from Port Augusta to Perth, and in the Stuart Ranges. The typical burrow, as it is excavated in these districts, is easily identified, not only from the track of the animal and the characteristic mark made by its tail, but by the actual construction of the burrow itself. Unlike many burrowing animals, it does not make an exit and an entrance hole. The burrow has a single opening, and from the mouth it descends with a fairly steep, but ever opening, spiral to a depth of five feet or more. The spiral construction seems to be universal, and the work involved in digging out a burrow is very considerable, for the animal by no means always selects those spots where the soil is loose, as Waterhouse affirms. According to Sir Baldwin Spencer, *T. minor* differs from the other members of the Genus in that " during the winter months it lies within a foot or so of the entrance of its burrow, and only uses the inner chamber during the summer." *T. sagitta*, *T. nigripes*, and *T. lagotis* seem to occupy the furthest recesses of the burrow at all times, and it is necessary to dig them out, whereas the blacks capture *T. minor* by stamping in the burrow behind it.

Not only does *T. sagitta* spend the whole day at the bottom of its burrow, but in the region to the west of Lake Eyre, where alone I have field experience of it, it spends the whole of the cold weather, for it does not come abroad in the evenings of the short but sharp winter.

It is a feature not confined to the burrows of *Thalacomys*—for the homes of many creatures which live underground in the arid Centre show the same characteristic—that though maybe a barrow load of earth must have been removed in the excavation, the mound of debris at the entrance consists of no more than a bucketful.

By Krefft it is said not to be so ferocious as its large canines would lead one to susupect. To a certain extent that it true, and the animal can only be described as being extremely inoffensive. Nevertheless, all those with which I have had to deal have needed the exercise of considerable caution in their handling. They bite readily and savagely when interfered with, and, though the bite may not be very severe, it is aggravated by the fact that the animal will not readily let go, and effects multiple bites from a single hold.

Bilbies are strictly nocturnal and come abroad at a later hour than any other marsupials that I have observed. Those I have had living in captivity (in a large open-air run) have often been noticed to appear at dusk but, after a hurried look round, retreat to bed again and not reappear for an hour or so. They seem, however, to have no objection to moonlight. During the day time they sleep in a remarkable posture and they do not, as a rule, lie down on their sides as most animals do. The long ears are laid back, and then folded forwards against the side of the head so that the tips come forward over the eyes and alongside the snout. The animal then squats on its hind legs and tucks its long snout between its fore legs, so making itself into a round silky ball; the tail being usually bent forwards between the legs, or protruded straight behind it.

When the animal wakes in the evening, it often starts its perambulations with one ear laid back and the other still doubled forward in the sleeping position. It is curious that, though the ears are kinked flat upon themselves for the greater part of the time, there is no indication of a crease, or folding line, where the flexure takes place.

In any gait the hind limbs move together. In slow progression the fore limbs move alternately; in more rapid movements they move in unison, but alternately with the synchronously acting hind limbs. Waterhouse noted of one which lived in the gardens of the Zoological Society of London that—" when walking the hind legs only were used, and these were very widely separated. The tail assisted slightly in supporting the body, which was but little raised in front." I cannot help thinking that this is an erroneous observation. It is quite true that the hind legs are widely separated, and that the body is but little raised in front; but I do not think that the animal ever progresses on its hind legs alone in true saltatory fashion. It can make a good pace, though its progress always appears to be shuffling and somewhat ungainly. Its greatest safeguard is its aptitude for digging itself in, and the speed with which it can make for the shelter of its burrow.

In almost all published figures, and in most mounted specimens, the animal is represented as standing far too high on its legs. Such figures as Lydekker's Monotremes and Marsupials, 1894 (Plate XX), and the mounted specimen photographed by Lucas and Le Souef, Animals of Australia, 1909 (Figure p. 137) give very incorrect postures for the animal.

The toilet of the long silky hair is very elaborate, and it is performed as usual by the synadactylous pedal digits; the manus remaining unemployed. An amimal, which had suffered the loss of a hind leg in a rabbit trap, made vigorous attempts to scratch itself with the short stump, but it never attempted to replace the office of the absent member by the employment of its hands. The change of pelage takes place twice a year, in February and September, and is a prolonged affair. The new coat first appears upon the head, and slowly spreads backwards over the shoulders and along the back. There is a very sharp line of division between the old coat and the new, for the new hairs remain for a long while considerably shorter than the old, and they are distinctly more warmly coloured; the old coat appearing long and silvery, and the new coat short and fawn coloured.

The main guiding sense is olfactory, and, during daylight, at least, the power of vision appears to be by no means acute. A grasshopper, even though it be actively moving, is detected in the daytime by scent before it is detected by sight.

When active in the dark the auditory sense is evidently very keen, and although Bilbies will take no notice of a person who remains quite still, they will detect a distant footfall with remarkable quickness. They appear to produce no vocal sound save an inspiratory hiss when disturbed.

In normal seasons the young are born from about March to May, and one or two constitutes the usual litter. In the Centre the breeding season is regulated more by the rains and the abundance of food than by the actual period of the year.

The reason for the rapid decrease in numbers of the Bilby is not quite obvious. Certainly these useful animals have been ruthlessly slaughtered in all districts within reach of the more settled aeras. Their pelts have been marketed in the skin sales in Adelaide in very large numbers; and they have been more wantonly killed for "sport." Large numbers have been killed or maimed in steel traps set for rabbits, and possibly many have fallen victims to poison baits. As with all the more defenceless marsupials, the introduced fox has probably played its sinister part. But in the Centre, where the fox is still absent, or rare, and where the Bilby is but little molested by man, it seems that some other factor must be invoked; and this is probably the extraordinary abundance of rabbits, and the consequent struggle for breeding burrows. There is certainly no part of this State where the Bilby is not a rapidly disappearing animal.

Genus 7.—CHOEROPUS (Ogilby, 1838).

So far only one member of this Genus has been described, and this remains an exceedingly rare animal. The form is light and slender. The muzzle short and narrow. Nose sharp and pointed, the naked rhinarium confined to the extreme tip. Ears very long; processus antihelicis duplicated as in *Perameles*, the projection of the superior process short but broad. (*See* Figure 124.) Pouch opening

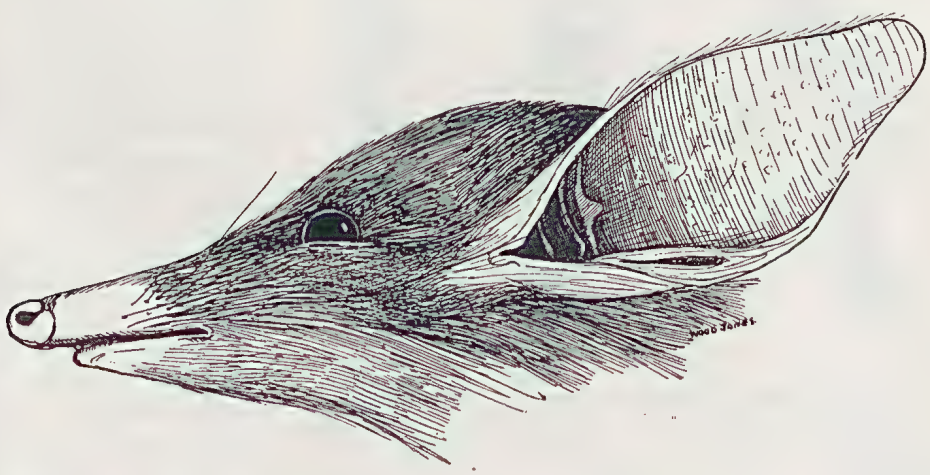

Figure 124.—Characters of head and ear of *Choeropus castanotis*. Natural size. From a male specimen from Ooldea. South Australian Museum.

backwards; nipples eight. Fore limbs long and slender. Fore feet with the first and fifth digits entirely wanting, the fourth minute, rudimentary, and only reaching to the middle of the metacarpus of the third; the second and third digits

alone fully developed. Hind limbs long and thin. The hallux entirely absent, fifth digit short and rudimentary, the large fourth digit composing the whole bulk of the foot. The small second and third digits syndactylous. Soles hairy, a small naked pad at the base of the fourth toe. Tail long, boldly crested along its upper surface. Skull broad and flattened, with a short narrow muzzle. (*See* Figures 126 and 127.) Bullae small, rounded, and complete. Dentition I. $\frac{3-3}{3-3}$. C. $\frac{1-1}{1-1}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{4-4}{4-4}$.

Choeropus may be regarded as a specialised cursorial offshoot of the plains-inhabiting members of the Genus *Perameles*. Only one rare and interesting species is comprised within the limits of the Genus, this species being an inhabitant of South Australia.

Pig-footed Bandicoot.

CHOEROPUS CASTANOTIS (Gray, 1842).

The scientific name which was first bestowed upon this animal by Ogilby, its original describer, was *Choeropus ecaudatus*. This name was given to it because the original specimen captured by Major Mitchell in 1836 had lost its tail, doubtless in consequence of fighting. The fact that the animal was originally described as having no tail led to a rather curious incident, for Krefft, in his anxiety to obtain specimens of the tailless animal that Major Mitchell had described, offered high rewards to the natives of the lower Murray. The result, in Krefft's own words, was that "the cunning natives, not succeeding in finding the animal required, were in the habit of bringing any number of the common Bandicoot with the tail screwed out." Since the name *ecaudatus* (or tailless) is quite inappropriate for an animal which normally has a long tail, it has been generally replaced by the more appropriate name of *castanotis* (or chestnut eared) given to it by Gray.

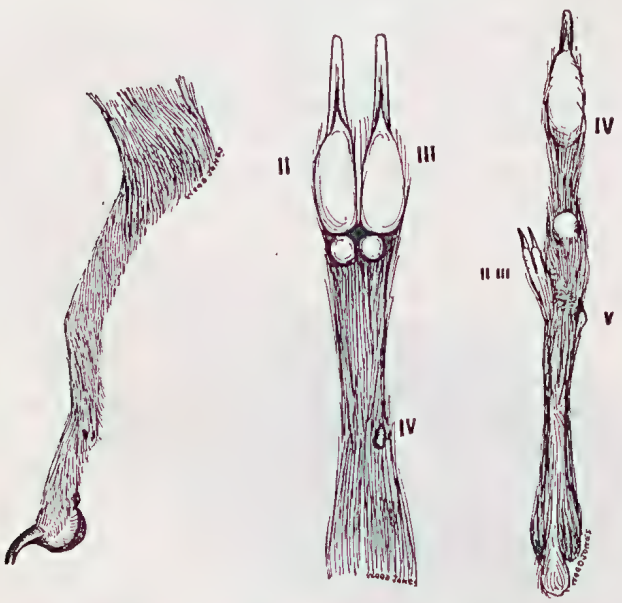

FIG. 125.—Left fore limb, manus and pes of *Choeropus castanotis*. Fore limb and pes natural size, manus twice natural size. Male specimen from Ooldea, South Australian Museum.

Size small, form delicate. Hair coarse but not spiny, coat texture not unlike that of *Perameles myosura*. Under-fur abundant, slaty-grey at the base, dull yellow at the tip. General colour of the head and body uniform grizzled light,

almost orange-brown colour. Ears long and narrow, their outer margins slightly concave just beneath the tip; thinly haired; their backs dull chestnut-brown, darkening towards the tips. Processus antihelicis short and broad. Longer hairs of head and back brown tipped; under-fur yellow tipped. Chin, chest, and ventral surface of body light fawn. Limbs long and slender; short-haired, pale-grey or white with a yellowish tinge. Palms wholly hairy, except on the terminal pads of the two well developed digits; these (second and third) with long slender claws; the rudimentary fourth digit is a mere horny tubercle. Pes very long and narrow, hairy except just below the heel, on the small circular pad at the base of the fourth digit, along the underside of that digit, and on its very large terminal pad. (*See* Figure 125.) Tail more than half the length of the body, with a terminal crest which, on the dorsal aspect, commences at about 70 mm. from the tip.

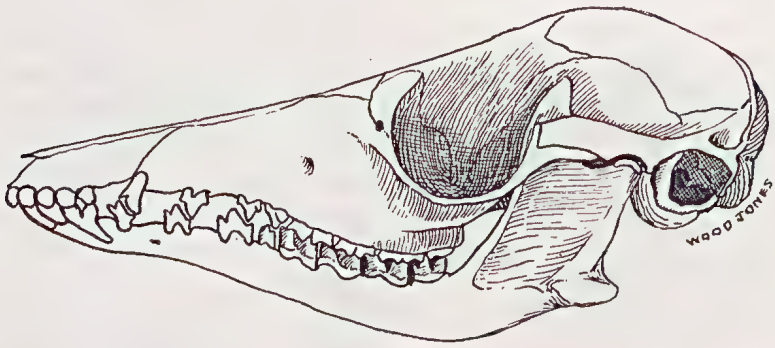

FIGURE 126.—Lateral view of the skull of *Choeropus castanotis*. One and a half times natural size.

Towards the base of the tail the hairs of the crest are dark-brown, but at the tip, where they measure 22 mm., they are white. On the ventral surface there is also a smaller crest of white hairs, commencing at about 30 mm. from the tip and reaching a length of 12 mm.

Pouch opening downwards and backwards. Nipples eight in number.

The skull is remarkable for its great breadth across the eye sockets and its short but narrow muzzle. (*See* Figures 126 and 127.)

DIMENSIONS.

	Adult ♀. Stuffed. Brit. Mus., N.S.W.	Adult ♀. Spirit. Spencer. Charlotte Waters.	Adult ♂. Spirit. Ooldea. S.A. Mus.
Head and body	250	230	240
Tail	*c*100	139	130
Hind foot	69	69	63
Ear	52	54	60

DIMENSIONS OF SKULL.

	Adult ♀. Brit. Mus., N.S.W.	Ryan's Well. S.A. Mus.
Basal length	53	57
Breadth	31	32
Nasals, length	22·5	24
Palate length	36·5	37
C—M^4	—	22

The great interest attached to the Pig-footed Bandicoot lies in the modifications to a cursorial life which find expression in the structure of manus and pes. In the manus there are two functional digits, and in the pes only one developed for the purpose of progression and support. The manus is therefore assuming the condition of the cloven-hoofed (artiodactyle) Ungulates; but with the difference that in the Pig-footed Bandicoot the functional digits are the second and third, whereas in the pig they are the third and fourth. The pes in a like fashion is mimicking the condition of the solid-hoofed (perissodactyle) Ungulates, but again with the difference that in the horses the functional digit is the third, whereas in *Choeropus* it is the fourth. By convergence, the manus and pes have come to resemble the fore feet and hind feet of other animal types, but the elements which are employed to produce this general rough similarity are different in the two cases. The beginnings of the beautiful adaptations which culminate in the production of the manus and pes of *Choeropus* can readily be seen in such a form as *Perameles myosura*. Comparison of Figures 125 and 103 should be made; and it will be noticed that the *Choeropus* type of manus and pes may be considered as exaggerations of the *Perameles* condition, just as the condition of *Antechinomys* (Figure 77) exaggerates that of *Sminthopsis* (Figure 71). Both are adaptations of the feet in animals living in open plains, the one a cursorial and the other a saltatory type.

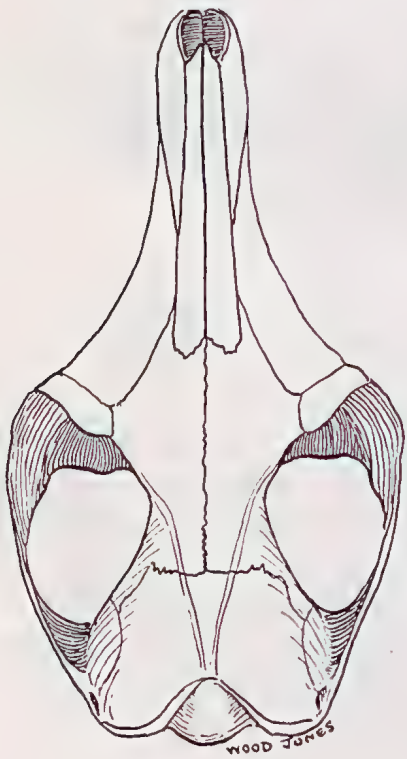

FIGURE 127.—Dorsal view of the skull of *Choeropus castanotis*. One and a half times natural size.

The gait of *Choeropus* was described by Krefft as like that of a "broken-down hack in a canter, apparently dragging the hind quarters after it." I know no more precise account of the sequence of movement of the limbs, and but few white men have been fortunate enough to observe the living animal, for almost all the specimens that have been procured have been captured by the blacks.

Although a very rare animal, the Pig-footed Bandicoot has an extremely wide distribution in the Centre, and it inhabits the interior portions of Queensland, New South Wales, South Australia, Western Australia, and Northern Territory.

Major Mitchell's original, and tailless, specimen was captured on the Murray plains; but from the place of its original finding it seems to have disappeared long ago. Specimens in the South Australian Museum come from Cooper's Creek, from near Ooldea, and from the Gawler Ranges. Probably it still lives in the neighbourhood of Ooldea, but specimens have not been met with in that district for some years. Sir Baldwin Spencer procured examples from Charlotte Waters in 1895. In 1920 one was killed between Miller's Creek and Coward Springs to the south and west of Lake Eyre, but unfortunately no part of the specimen was preserved. Although its distribution in the Centre is wide, it has always been a very rare animal, and now must be regarded as a disappearing one.

The animal constructs a nest very much after the fashion of *Perameles myosura*, and it was met with as a rule by men who were droving cattle, the animal being disturbed by the tramping of the beasts.

It appears to be by no means strictly nocturnal, and on several occasions has been seen in the open in broad daylight. In diet it is omnivorous; such things as grass, barley grass, lettuces, tender leaves, bulbous roots, grasshoppers, and bread are mentioned as having been eaten, but Sturt noted that it showed a much greater partiality for flesh, although it did not flourish on this diet. Doubtless it would be easy to keep healthy in confinement on a diet such as that acceptable to *Perameles myosura*. Pig-footed Bandicoots are said to squat in the open with their ears laid back very much after the manner of little rabbits, and when chased by dogs, to seek the shelter of hollow logs or hollow trees. In the districts to which they are now confined they would be hard put to to find a log, let alone a tree; and the only living specimen of which I have had a first-hand account was noticed dodging about among the saltbush in full daylight. Once open country of this type has been invaded by the fox, the fate of *Choeropus* is sealed. Two young are produced at a birth, and the breeding season is in June. Nothing is known of its sensory perceptions, or of the intimate details of its life history, although as an anatomical type it has been fairly well studied. The name by which it is known to the Kukata blacks is Wilalya, and they regard it as an animal which has always been rare and which is now extinct in their country.

Section II.—SYNDACTYLA DIPROTODONTIA.

In this section are included the marsupials which have the second and third pedal digits bound together, but have lost the full set of little front teeth typical of the first section of the Syndactyla and the whole of the Didactyla. In the present group the number of front teeth is reduced, and the size of the individual teeth is increased, a change which is usual in herbivorous animals. (*See* Figure 128) Although the front teeth are not by any means always reduced to two, the term diprotodont is conveniently applied to them; and it must be understood that the animals here termed Syndactyla diprotodontia are the Diprotodontia (as opposed to the Polyprotodontia) of those classifications in which the characters of the teeth are given precedence of the characters of the pes in taxonomic importance. The

Syndactyla diprotodontia comprises the didelphian animals which are most typically marsupial; that is to say, they are the most completely specialised members of their phylum. They are herbivorous, arboreal, saltatory cursorial, or fossorial animals; all of rather low intelligence, and some distinctly phylogenetically senile. The pouch is well developed in all, and they may be said to be perfected marsupials, the high water mark of marsupial specialisation, and, therefore, proportionately sundered from the primitive mammalian type.

Within the section there is embraced a rather wide variety of types, the classification of which has always proved to be a somewhat difficult problem. Such

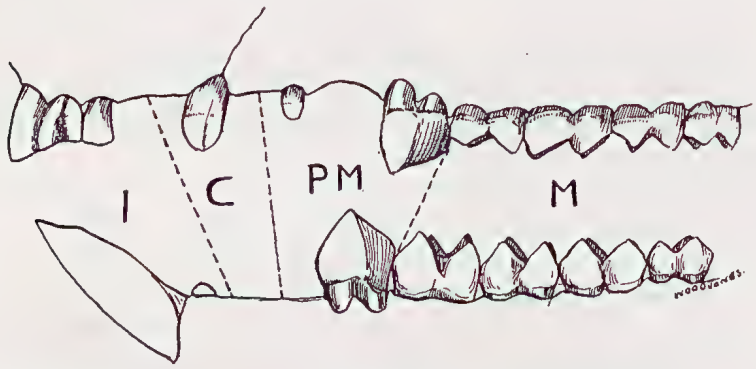

FIG. 128.—A diprotodont type of dentition as it is present in an opossum (*Trichosurus vulpecula*). This figure should be compared with Figure 5 in Part I., where the polyprotodont type of dentition of *Isoodon obesulus* is illustrated.

apparently diverse forms as the opossums, the koala, the wombats, and the kangaroos, wallabies, and rat kangaroos, have to be accommodated in the classification. Many schemes have been put forward, and there is a distinct modern tendency to overcome the difficulties by increasing the number of families within the group. These more recent systems will not be adopted here, for some of them have been founded upon an insufficient first-hand acquaintance with a wide series of types of the marsupials, and they very commonly show a tendency to elevate into family rank some one type which happens to have been more or less exhaustively, but not comparatively, studied. Here the phylogenetic researches of Bensley will be taken as the main guide in classification, and the temptation to create separate families for the reception of somewhat divergent forms will be resisted as far as possible.

In the first place, there can be little doubt that the opossums, or phalangers, form a basal or central group which represents the nearest approach to the primitive arboreal stock of the diprotodonts. This group is distinguished as the *Phalangeridae*. Then again there is the well defined assemblage of saltatory terrestrial forms, of which the kangaroos may be taken as the most perfected type, and this group is known as the *Macropodidae*. Lastly, the wombats form a divergent group which, though having obvious linkages to certain of the arboreal forms, is sufficiently distinct to constitute a separate family, the *Phascolomyidae*. Considered, therefore,

in a simple and conservative way, the Syndactyla diprotodontia may be divided into families as follows :—

(A.) Upper incisors at least 2—2. Molar teeth rooted.

(B.) Pes short, with a well developed first digit, which is often opposable. The masseteric fossa shallow.

Family I. *Phalangeridae.*

(B¹.) Pes elongated, usually lacking the first digit. Masseteric fossa deep.

Family II. *Macropodidae.*

(A¹.) Upper incisors only 1—1. Molar teeth unrooted.

Family III. *Phascolomyidae.*

[The masseteric fossa is the name given to the depression upon the outer side of the lower jaw into which the masseter muscle is inserted. The fossa is illustrated at Figure 129.]

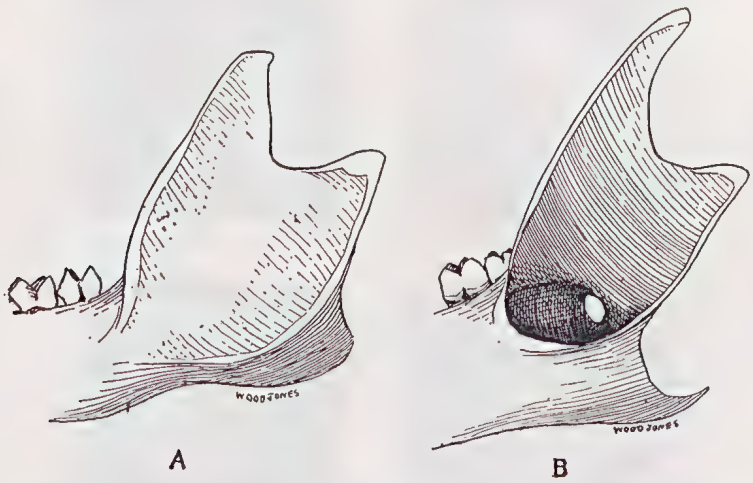

FIGURE 129.—The posterior part of the lower jaws of (A) a member of the Family Phalangeridae (*Trichosurus*) and (B) a member of the Family Macropodidae (*Bettongia*), to show the shallow masseteric fossa in the first and the deep fossa in the second.

Of these three Families the first is the most primitive in the general characters of its members, and it embraces the Opossums, Ring-tailed Opossums, Flying Opossums, Dormouse Opossums, Cuscuses, Koala, and *Tarsipes*. It is most conveniently divided into Sub-families as follows :—

FAMILY I.—PHALANGERIDAE.

(A.) With cheek-teeth well developed ; tongue short and not extensile.

(B.) Digits 1 and 2 opposable to the remaining digits. Molar teeth with crescentic cusps. (*See* Figure 130.)

Sub-family 1. *Phascolarctinae.*

(B¹.) Digit 1 alone opposable to the remaining digits. Molar teeth with mound-like cusps. (*See* Figure 130.)

Sub-family 2. *Phalangerinae.*

(A¹.) With cheek-teeth degenerate ; tongue elongated and extensile.

Sub-family 3. *Tarsipedinae.*

Sub-Family 1.—PHASCOLARCTINAE.

Division of the Sub-Family into Genera.

(A.) Tail well developed. With small teeth present between the canine and the last premolar.

(B.) Without a flying membrane.

Genus 1. *Pseudochirus.*

(B¹.) With a flying membrane.

Genus 2. *Petauroides.*

(A¹.) Tail rudimentary. No small teeth between the canine and the last premolar.

Genus 3. *Phascolarctus.*

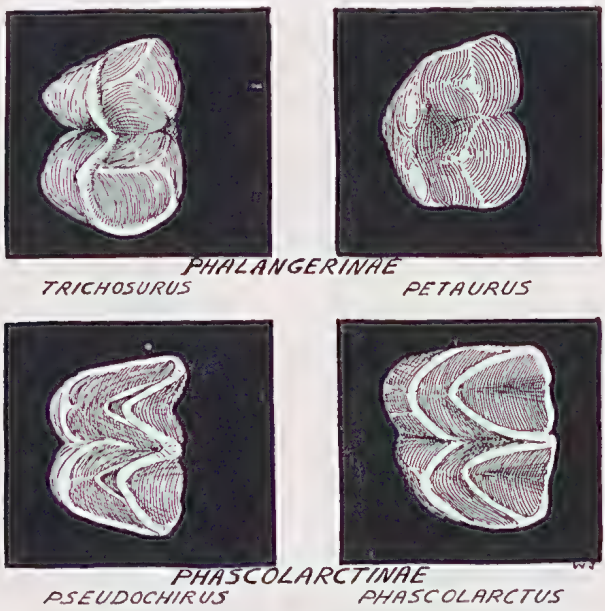

Figure 130.—The first left upper molar tooth of two members of the Sub-family *Phalangerinae* and two of the Sub-family *Phascolarctinae* to show the mound-like (bunodont) cusps in the former, and the crescentic (selenodont) cusps in the latter.

Genus 1.—PSEUDOCHIRUS (Ogilby, 1836).

This Genus includes the familiar little Ring-tailed Opossums, of which there are nearly thirty recognised species. This large assemblage of forms is usually split up into five Sub-genera, as follows :—

(A.) Ears longer than broad ; tail with a white tip.

(B.) Tail evenly bushy ; naked part short ; nasal bones reaching forwards only to about the level of I^3.

Sub-genus 1. *Hemibelideus.*

(B¹.) Tail short-haired terminally ; nasals reaching as far forwards as $I.^1$. (*See* Figure 135.)

Sub-genus 2. *Pseudochirus* (*sens. strict*).

(A[1].) Ears broader than long ; tail usually without a white tip.
(C.) Form robust. Molars 1-3 more than 10·5 mm.
(D.) Bullae moderate size ; tail long.
Sub-genus 3. *Pseudochirops.*
(D[1]) Bullae extremely large ; tail short.
Sub-genus 4. *Petrosuedes.*
(C[1].) Form slender. Molars 1-3 less than 10·5 mm.
Sub-genus 5. *Pseudochirulus.*

Sub-Genus 1.—Hemibelideus (Collett, 1884).

There is no South Australian member of this Genus, both forms embraced within it being confined to Queensland.

Sub-Genus 2.—Pseudochirus (Ogilby, 1837) *sens. strict.*

The members of the Sub-genus to which the name *Pseudochirus* is applied in its modern narrowed sense may be termed the typical Ring-ta led Opossums ; and of the half-dozen or more species which inhabit Australia there is only one which occurs in this State. In general, the characters of the Sub-genus are as follows :— Small or medium sized animals, adapted to arboreal life. Fur somewhat woolly. Ears medium in size, hairy behind. Palms and soles naked, with striated pads. Tail with a naked and prehensile termination. The nasal bones projecting in front of the premaxillae. Interorbital region somewhat concave. I^2. slightly bicusped. Dentition I. $\frac{3-3}{2-2}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{3-3}{1-1}$. M. $\frac{4-4}{4-4}$, as a rule, but the number of small intermediate teeth is variable.

South Australian Ring-tailed Opossum.

Pseudochirus laniginosus (Gould, 1858).

This animal has long been known as *Pseudochirus peregrinus* (Boddaert, 1785) ; but, as Oldfield Thomas has recently shown, the animal to which that name rightly belongs came from the Endeavour River, and its description differs widely from that of the present species. The form which inhabits this State differs considerably from that which occurs to the north and east, and is distinguished as *Pseudochirus laniginosus notilis* (Thomas, 1923). The South Australian animal is in general a grey and white opossum, with only a slight admixture of rufous colouration. Fur woolly, soft, and fine, the long hairs of the back measuring about 30 mm. in length. The dorsal surface coloured rather varying shades of grey, the pelage being finely grizzled, each hair being dark at the tip and banded with white for a space of about 2 mm. below the tip. The hair, when parted, shows a smoky grey under-fur. The face is grey, slightly grizzled with rufous ; the rufous colouration being especially marked around the eye. There is a white patch below and behind the eye, separated from the white hairs of the muzzle and chin by an interval of hair of the general body colour. (*See* Figure 131.) The crown of the head and the mesial margins of the ears darker grey than the face, or than the general body colour. Upper lip, chin, throat, ventral surface of the body, and inner surface of the limbs pure white.

Outer side of limbs inclined to be distinctly more rufous than the general colour of the dorsal surface of the body. Manus and pes paler than the dorsal surface of the body, the manus being darker and usually more rufous than the pes. Base of tail, for a space of some 70 mm., covered by hair of the general body colour and texture. Distal to the basal fluffy portion of the tail the hair becomes shorter, more closely adpressed and shining in texture. The basal furry-portion is grizzled, like the general colour of the dorsal surface of the body; immediately following this, for a space of about 90 mm., the smooth-haired portion is almost black, the terminal 160 mm. being pure white. The tail is markedly prehensile, the underside of its tip being naked for a distance of about 105 mm. The ears are large, somewhat rounded in outline, nearly naked on their inner sides, hairy on their outer sides. The hair on the dorsum of the ear is dark, almost black towards its inner side, pure white to its outer and hinder margin. This white patch on the back of the ear is continuous with a long tuft of white silky hair which appears below the lower border of the ear behind the white cheek patch. The processes of the auricle are somewhat complex. The main processus antihelicis is well developed, slightly broader along its attached base than the distance from its base to its free tip; in addition, two accessory processes are developed nearer to the tip of the ear. The tragus and the bursa are well developed. (*See* Figure 132.) All facial vibrissae are well developed and, as a rule, they are wholly black in colour. The mysticial set is arranged in six rows, the longest bristles measuring 65 mm. The genals

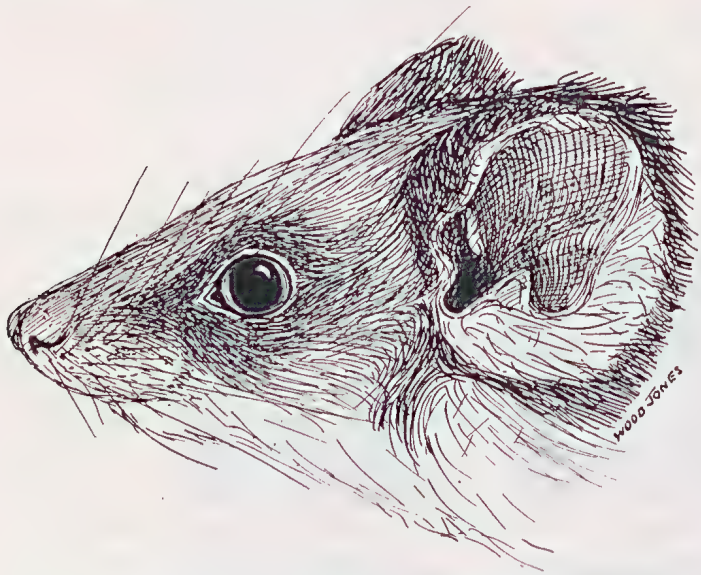

FIGURE 131.—Characters of the head of *Pseudochirus laniginosus notilis*. Natural size.

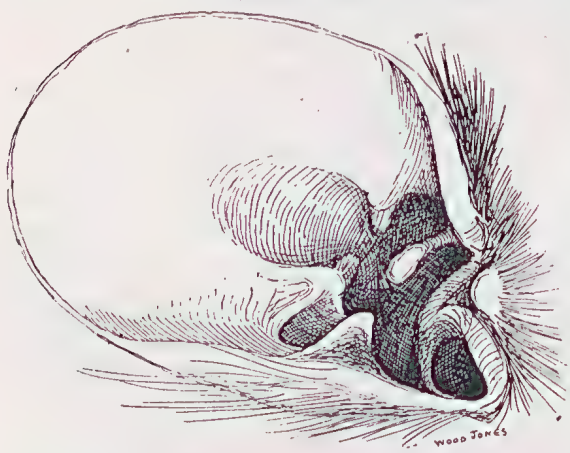

FIGURE 132.—Characters of the ear of *Pseudochirus laniginosus notilis*. One and a half times natural size.

and supraorbitals are also well represented. There is a small tuft of ulnar carpals, and a set of median antebrachials. The calcaneal vibrissae are obvious on the pouch young, but are not conspicuous in the furry adult.

The rhinarium is naked and pink; in texture it is finely granular; it is cleft in its whole length in the middle line, and makes a considerable contribution to the upper lip.

The eye is surrounded by fine dark eyelashes. The pupil is circular, the iris bright golden brown.

The palmar surface of the manus is white, or pale flesh coloured, naked, and granular, with well developed striated pads. The apical pads are finely striated; the interdigital pads are all present,

FIGURE 133.—Left manus of *Pseudochirus*. Twice natural size. The inset shows the manner in which the manus is cleft and digits 1 and 2 are opposed to digits 3, 4 and 5 in grasping.

the first interdigital being confluent with the thenar pad. The digital formula is $4 > 3 > 2 > 5 > 1$. (*See* Figure 133.). In grasping, the first and second digits are opposed to the third, fourth, and fifth. The pes has a naked granular sole, with six well developed and striated pads, the first interdigital and the hallucal pads being separate. The apical pads are all striated. The first digit is large, clawless, and opposed to the remaining digits. The digital formula is $4 > 5 > 2$ $3 > 1$. (*See* Figure 134.) The pouch is well developed, the opening forwards. Four nipples are present, but only the posterior pair is fully developed and functional.

The general characters of the skull are shown in Figure 135.

DIMENSIONS.

	All from Mount Lofty, Measured in the flesh.			
	Adult ♂.	Adult ♀.	Adult ♀.	Adult ♀.
Head and body	340	330	380	360
Tail	365	320	320	340
Hind foot	40	40	41	41
Ear	35	37	40	39
White portion of tail	155	150	170	155
Naked portion of tail	110	105	105	100

DIMENSIONS OF SKULL.

	Adult ♀. Mt. Lofty.
Basal length	58
Breadth	35
Nasals, length	25
Palate length	30
Interorbital construction	7

Ring-tailed Opossums are still fairly common in the wooded and cultivated districts, and it is probable that the foot hills of the Mount Lofty Ranges will afford them shelter for many years to come. They do not make their presence so obvious as do the Bushy-tailed Opossums (*Trichosurus*), for they have not in general adopted the latters' habit of living in the roofs of houses. They prefer to live out in the trees, where they either construct a well built drey among the branches, or take possession of a hollow branch which they line with nesting material. Even in captivity they are industrious nest builders, and they invariably fill their sleeping boxes with a great assortment of twigs and dead leaves.

FIGURE 134.—Left pes of *Pseudochirus*. Twice natural size.

Except for the damage that they do in the fruit gardens they are thoroughly inoffensive animals. Though very beautiful and attractive creatures in captivity, it must be admitted that, as pets, they fail somewhat owing

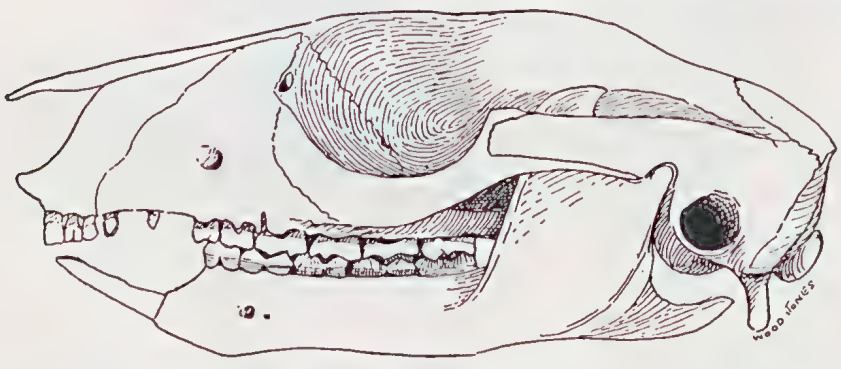

FIGURE 135.—Lateral view of the skull of *Pseudochirus laniginosus notilis*. One and a half times natural size.

to their pronounced stupidity. They learn in time that the person who feeds them regularly, and pays careful attention to their comfort, is not greatly to be feared ; but I doubt if their intelligence carries them much further than this in their relations with those who look after them. They permit themselves to be handled freely enough, and are, to that extent, gentle animals ; but there is very little that is reciprocal in their intimacies with man. They appear to learn not to expect ill treatment, but seem unable to evince any response to good treatment. This may, in part, be due to the fact that their eyes are very definitely adapted to the dark, and that they are, therefore, always at a disadvantage in daylight. But, like many animals with dark-adapted eyes, they become very much more suspicious and less reconciled to restraint at night time. Their expression is at all times of a fixed, staring kind, and in their relations with each other they appear to preserve the same apparent stupidity, and the same vacant stare, as they employ in their dealings with man. If two fall out, one will not permit the other to enter the sleeping box, and the rejected animal will curl up in a ball outside, staying there day and night to its great discomfort. Should it decide to enter the box, and in doing so encounter the tenant in the doorway, the meeting will consist in their regarding each other with a prolonged unaltering stare, and then one or the other will give in, and curl up in a ball again. Although very agile, and capable of extremely graceful movements, the usual procedure, when suddenly encountered, is to remain motionless, like a stuffed animal, gazing straight ahead with a meaningless, fixed stare. When quite sure that its stillness has not deceived the intruder, the animal will slowly start to creep away. When running on the ground, Ring-tailed Opossums can go at a fair speed, but owing to the low carriage of the head and tail, and to the waddling type of gait, they are far from graceful when forced to make their way across open country. When climbing, they evince the universal characteristic of animals which have prehensile tails, for they trust the tail grip and the grasp of the pes far more than they rely on the hold of the hand. They therefore always descend head downwards, and do not hesitate to relinquish the grasp of the manus no matter what the position may be.

They are extremely quarrelsome, and for the greater part of the year the females will not permit the males to come near them ; the introduction of a male into the domain of a female being the certain prelude for a fight. The fighting is never very prolonged, for one or the other soon admits defeat and withdraws. The female appears to be far the more aggressive, the male being, as a rule, glad enough to slink away and avoid further encounter.

The voice is comparatively rarely used, and it consists in a rather musical, almost bird-like, repetative note. This pleasing note is not often uttered, and probably most people hearing it in the open would not suspect that it was produced by a mammal. It differs altogether from the harsh grunt which is employed when fighting. The young animal, when separated from its mother, produces a shrill chirrup, which is very like the note made by bats. The breeding season is in the early months of the year, the young leaving the pouch about the end of April. They breed only once a year, and two young are usually produced at a time. The hairless young are dark-leaden colour, and not pink as are the young of *Trichosurus*. On leaving the pouch, the young animals are almost exactly like their parents,

and they cling to the fur of the mother, gripping their claws into her woolly hair and twining their tails about her body.

By daylight the sense of sight is poor, for the eyes are strongly dark-adapted. Probably by night sight is the principal guiding sense, and undoubtedly it is much assisted by the information imparted by the tactile vibrissae. For an arboreal animal the sense of smell seems to be unusually well developed, for a young animal is able to follow the track along which its mother has passed, and in this it is guided by scent alone.

The Ring-tailed Opossums are not confined to eucalyptus trees, for any type of tree which affords them a sufficient shelter will provide a home for them. Their range does not extend into the Centre, where the box trees lining the creeks afford a home for the Brush-tailed Opossums, and their distribution in the State is probably limited.

Sub-Genus 3.—Pseudochirops (Matschie, 1915).

This division of the Genus contains about a dozen recognised species which are mainly confined to New Guinea, only one member extending the range into Queensland. None is present in South Australia.

Sub-Genus 4.—Petrosuedes (Thomas, 1923).

The Sub-genus was created for the reception of the peculiar Rock Opossum (*Petrosuedes dahli*) of North-West Australia. This species has not been recorded in South Australia.

Sub-Genus 5.—Pseudochirulus (Matschie, 1915).

Some half-dozen species belonging to this subdivision of the Genus are present in New Guinea, but no member extends the range into continental Australia.

Genus 2.—PETAUROIDES (Thomas, 1888).

The Genus contains the fine " Flying Phalangers " of Eastern Australia. These handsome animals, known as Taguan Flying Phalangers or Great Flying Phalangers, occur in Victoria ; they were included in the Fauna of South Australia, by F. G. Waterhouse (Harcus's South Australia, 1876, p. 284), but I know of no record of their extension into this State.

It must be remembered that the Genus *Petauroides* constitutes only one of the three groups of Flying Phalangers, of which the other two will be mentioned later. It is a very remarkable fact, which cannot fail to impress the student with the complexities of animal adaptations, that three arboreal forms of syndactylous marsupials should have independently given rise to volant forms. The Taguan Flying Phalangers are undoubtedly volant derivations of more normal arboreal members of the *Phascolarctinae*, and it is to some form such as the Ring-tailed Opossums that we must look for their ancestry. The other Flying Phalangers, to be dealt with later, are equally clearly derived from other and distinct arboreal forms.

Genus 3.—PHASCOLARCTUS (Blainville, 1816).

With the Genus *Phascolarctus* specialisations have proceeded so far in certain directions that most authorities have assigned the rank of a separate Family or Sub-family to its only member. The sole representative of the Genus, the Koala, or Native Bear, exhibits a strange blend of characters, and in certain directions it departs from the type usual among the *Phalangeridae*, and, to a certain extent, it shows such striking likenesses to the Wombats that by many it is regarded as their near ally, and is therefore united with them in one family. That it is an example of extreme specialisation to tree climbing, and to tree clinging, is obvious; and in this specialisation it finds its parallels among the Monodelphia in the Sloths and Slow Loris. From a general survey of the anatomical

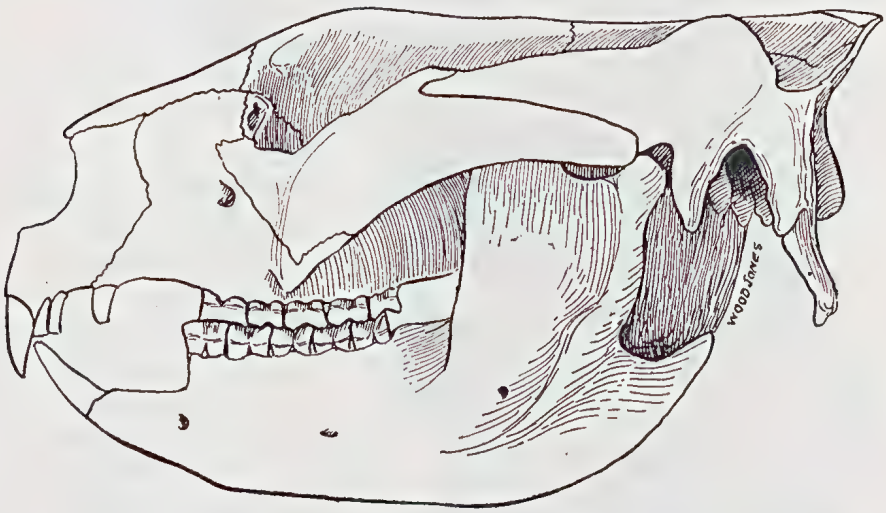

Figure 136.—Skull of *Phascolarctus cinereus*. Two-thirds natural size.

characters of the animal it is most reasonable to assume that it is a phylogenitically senile and over specialised Phalanger, and most nearly related originally to the Ring-tailed Opossums.

The size is large, and, owing to the stout and rather clumsy build of the body and practical absence of the tail, the general appearance is somewhat that of a little bear. The fur is dense and woolly. The ears are large and thickly covered with hair. The tail is reduced to a mere rounded projection. Both manus and pes are furnished with five strongly-clawed digits, the first and second digits of the manus being opposable to the other three. The palms and soles are granular without striated pads. Nipples two in number.

The skull (*see* Figure 136) is of remarkable form, being oblong, and remarkably straight sided. The bullae are peculiarly elongated and flattened from side to side. In respect to the posterior palatine vacuities, and in some other details, a likeness is shown to the skull of the Wombats. The dentition is I. $\frac{3-3}{1-1}$. C. $\frac{1-1}{0-0}$. P. M. $\frac{1-1}{1-1}$. M. $\frac{4-4}{4-4}$. It is generally agreed that only a single species represents the Genus to-day, but within the wide limits of its range it exhibits such considerable variation that Oldfield Thomas has recently separated the Queensland form as a sub-species to which the name *Phascolarctus cinereus adustus* (Thomas, 1923) has been given.

Koala, Native Bear, or Native Sloth.

PHASCOLARCTUS CINEREUS (Goldfuss, 1819).

This remarkable animal, of which the general figure is familar to everyone, needs but little description for the purpose of identification. (*See* Figure 137.) The dense woolly fur is for the most part dark-grey in colour, though considerable variation in the depth of coat colour is displayed. The hairy ears are fringed with white; and the chin, chest, ventral surface, and inner aspect of the fore limbs are usually pure white. The rump is variably dappled with whitish patches. The inner aspect of the hind limbs, and, in some specimens, the region of the hind end of the body, tawny yellowish. The tail reduced to a mere rounded prominence. The ears are hairy without and within. They are large and rounded in their outline. The processus antihelicis is not well developed: two tragoid projections are present (*See* Figure 138.) The rhinarium is remarkable for its curious backward extension towards the eye, and for the fact that it is thinly clothed with fine downy hairs. The nostrils are slit-like and confluent at the margin of the lip, their immediate edges are naked and shining. (*See* Figure 139.)

FIGURE 137.—General characters of *Phascolarctus cinereus*. Note the way in which the 1st and 2nd digits of the left manus are opposed to the 3rd, 4th, and 5th. About one-fifth natural size.

The pupil of the eye is remarkable in that it is vertical and slit-like; the iris is bright yellow-brown. The eye is small for so large an animal, and has a peculiar, almost comical, staring expression. All sensory vibrissae are poorly developed; the mystacial, supraorbital, and submental sets are alone represented by a few ill defined bristles.

The manus is relatively very large, and has for its digital formula $4 > 3 > 5 > 2 > 1$. (*See* Figure 140.) The first and second digits are markedly opposed to the third, fourth, and fifth, so that the hand appears to be cleft into two portions.

The first digit is not in any way specialised. All digits are armed with strong curved claws. Apical pads are present and striated, though the striations are not

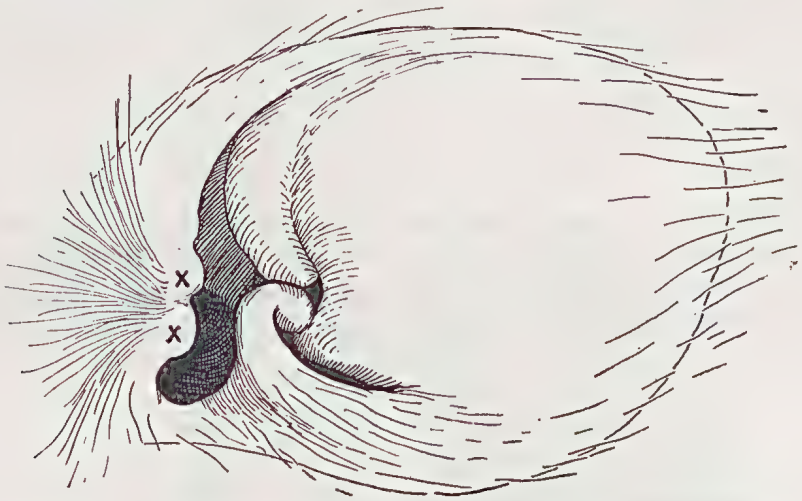

FIGURE 138.—External ear of *Phascolarctus*. The two tragoid projections are marked x. x.

very strongly developed. The palm is granular, and the pads are not well defined. In the pes the digital formula is $4 > 3{\cdot}2 > 5 > 1$. (*See* Figure 141.) The syndactylous digits are peculiarly well developed, doubtless in harmony with the depth of the dense fur. The first digit is short and greatly broadened; it possesses no nail. Strong claws are present on all the other digits. The apical pads are present and striated. The sole is naked and granular without differentiated pads.

The pouch is peculiar: the mouth is situated towards its hind end, and its lateral recesses extend far out on to the animal's flank. The nipples are two in number.

FIGURE 139.—*Phascolarctus cinereus*. Rhinarium viewed directly from the front.

DIMENSIONS.

	Brit. Mus. ♂	Brit. Mus. ♀
Head and body	810	750
Hind foot	96	98
Ear	62	58

DIMENSIONS OF SKULL.

	A. Brit. Mus. ♂	B.	C. Brit. Mus. ♀	D.	E.
Basal length	149	144	128	126	112
Breadth	88	84	75	70	72
Nasals, length	48	45	39	35	24
Palate length	80	69	67	63	60

The habits of the Koala are well known, for the animal is easily observed in a wild state, and it is not uncommonly kept in captivity as a pet. It may be said to spend its whole life clinging to, and feeding upon, the great eucalyptus trees.

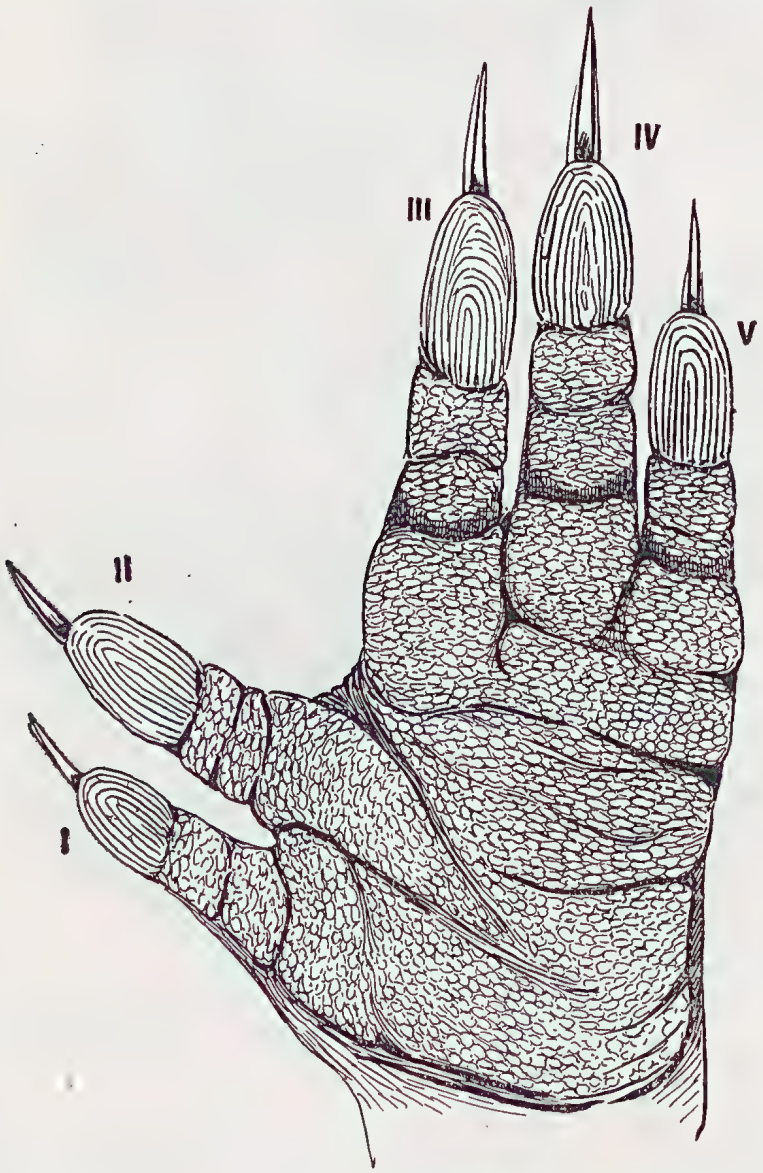

FIGURE 140.— *Phascolarctus cinereus.* Palmar surface of left manus.

In just so much as it is a perfected specialisation to its environment, so it is a slave to its environment. It has adapted itself to the gum tree, and has become dependent upon the gum tree. It must be regarded as an animal which has become phylogenetically senile as the outcome of complete specialisation; an animal which,

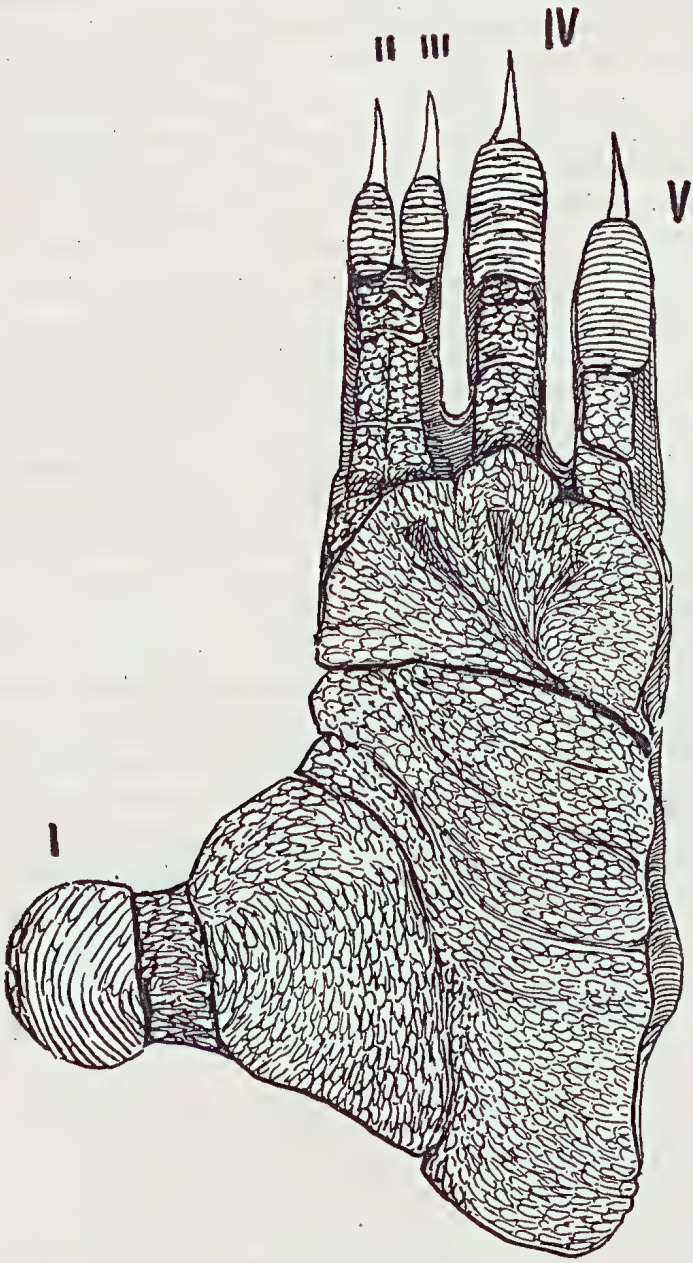

FIGURE 141.—*Phascolarctus cinereus.* Plantar aspect of left pes.

having lost its plasticity, has become dependent upon a definite mode of life in a restricted environment. A Koala driven from its elected environment cannot make itself at home in a new one as can rats, or foxes, or other plastic animals; indeed, it is an old observation that a Koala taken from a gum tree and liberated, will immediately climb the nearest tree and stay there. For this very reason it is

an animal that needs all the protection which legal enactments and popular opinion can afford it; and yet probably no animal has been so ruthlessly slaughtered in order to satisfy the demands of the fur trade. Lucas and Le Souef, in their Animals of Australia, make the remarkable statement that the fur "fortunately is not valued in the market" (p. 92); at the same time noting in the introductory chapter to their work (p. 6) that, in the year 1908, no less than 57,933 Koala pelts passed through the markets of Sydney alone. That this deplorable slaughter still goes on is evidenced by the fact that in the two years 1920 and 1921 Osborn and Anthony have ascertained that the huge total of 205,679 Koalas were killed for the fur market. Since in the fur trade Koala pelts pass under the name of "Wombat," many people assume that the Native Bear has ceased to be persecuted.

The complete extermination of the Native Bear would be a disgrace to Australia, and yet, from its dependence upon a particular diet and a particular mode of life, its tenure of continued existence must always be regarded as precarious. It should be rigidly protected and preserved where it still exists, and every effort should be made to extend its range, and to re-establish it in those areas from which it has already been exterminated.

The animal is wholly inoffensive, and makes a most curiously affectionate, even if rather an unintelligent, pet. When brought up in captivity it becomes strangely dependent upon human society, and dislikes being left alone. A Native Bear which has for long been treated as a pet becomes in the end a very exacting and babyish creature. The food is gum leaves, and the animal is very particular in the choice of the leaves that it eats: when it has ascended a tree to its liking it will eat the tender shoots, and before it changes its tree it will strip it of most of its young leaves. The whole animal smells strongly of eucalyptus, and its excretion of this pungent smelling substance is one of its drawbacks as a pet. In captivity it will take bread and milk, and it is curious that it laps rather than sucks its drink.

Although quite harmless, Koalas are powerfully armed with strongly curved claws, and they can scratch severely. The old males have a tremendous voice, somewhat like the braying of an ass, but this accomplishment appears to be only rarely exercised, the common vocal expression being a hoarse grunt.

A single offspring is produced at a birth, and the curious little creature clings to to the fur of its mother's back for a long while after it has left the shelter of the pouch.

Although a most thoroughly arboreal animal, and one that has been over specialised for arboreal clinging, it can shuffle along on the ground at a good pace; but if a tame one be placed on the floor it will make all speed to climb up the person who stands nearest, and the weight of the sturdily built body and the degree of development of the claws make this demonstration of friendship one that may be embarassing. It is extremely tenacious of life, even when mortally wounded, and horrible cruelties have been committed and recounted by those who have slaughtered them wholesale for the sake of their pelts. Indeed, one may say, on humanitarian grounds, that not only should the slaughter of the Koala for the fur trade be prohibited because the animal is eminently one to protect and not to exterminate, but it should be prohibited because, like the slaying of seals, it is the most brutalising occupation that a human being can undertake.

At one time the Koala was without doubt an inhabitant of South Australia, and many men now living can remember the time when it was by no means uncommon in certain districts of the South-eastern portion of the State. No more than ten years ago Koalas have been killed well within the geographical limits of South Australia. If it inhabits South Australia to-day is rather doubtful, although reliable information would point to the fact that a remnant of the stock may still linger not far from the Victorian border. So far as I know no example of the South Australian race has been examined scientifically, and no specimens seem to have been preserved. Victorian animals were liberated on Flinders Chase, Kangaroo Island, in November, 1923, and it is hoped that they will become established in that faunal sanctuary.

Sub-Family II.—PHALANGERINAE.

The members of the Sub-family are small or medium sized Phalangers which do not show the cleft manus in which digits 1 and 2 are opposable to digits 3, 4, and 5. The molar teeth have mound-like (bunodont) cusps.

Division of the Sub-family into Genera :—

(A.) Tail distichous (flattened, and fringed with hair along the sides). Molars $\frac{3-3}{3-3}$.

(B.) With a flying membrane. Face not striped.

Genus 1. *Acrobates.*

(B¹.) Without a flying membrane. Face striped.

Genus 2. *Distoechurus.*

(A¹.) Tail not distichous, but cylindrical and evenly haired. Molars $\frac{4-4}{4-4}$.

(C.) Claws of the manus short, not exceeding the apical pads. Tail evenly short haired terminally.

Genus 3. *Dromicia.*

(C¹.) Claws of manus long, extending beyond the apical pads. Tail not short-haired terminally.

(D.) Tail hairy to end.

(E.) Without a flying membrane.

Genus 4. *Gymnobelideus.*

(E¹.) With a flying membrane.

Genus 5. *Petaurus.*

(D¹.) Tail naked at the end.

(F.) Fourth digit of manus much longer than the others. Last lower premolar lower than molars.

Genus 6. *Dactylopsila.*

(F¹.) Fourth digit of manus not greatly elongated. Last lower premolar as high as the molars.

(G.) Tail naked all round at end.

Genus 7. *Phalanger.*

(G¹.) Tail bushy to end above and at sides, naked below. Genus 8. *Trichosurus.*

Genus 1.—ACROBATES (Desmarest, 1817).

The little animals included in this Genus are known as Pigmy Flying Opossums. One species (*Acrobates pygmaeus*) inhabits continental Australia, and extends through Queensland, New South Wales, and Victoria ; on one or two occasions it has been taken in that portion of South-eastern South Australia which appears to be geographically, though not politically, a part of Victoria. The characters of the Genus are that the animals are small, and bear upon their flanks a parachute membrane, the constitution of which is such that a very narrow skin fold is converted into a plane by the development of an even fringe of hairs along its margin. The tail is distichous, consisting of the central axis with a fringe of stiffish hair springing from each side of it. The apical pads of the digits are large, but the claws extend beyond the tips of the digits. Dentition I. $\frac{3}{2-2}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{3-3}{3-3}$.

Figure 142.—General dorsal view of *Acrobates pygmaeus*. Natural size.

Pigmy Flying Opossum. Feathertail.

Acrobates pygmaeus (Shaw, 1794).

Form very light and delicate, the animal being one of the smallest of the Didelphia. (*See* Figure 142.) Fur very soft and silky. General colour a rather warm brown on the dorsal surface, pure white below. Face light-brown, a slight admixture of greyish hair is present on the muzzle region ; area immediately around the eye dark-brown. Outer surface of limbs brown like the dorsal surface. Manus and pes light rufous brown. The whole of the tail light-brown, somewhat paler below than above. The inner side of the limbs, like the whole of the ventral surface, pure white ; the hairs being white to their roots. The hairs of the under side of the parachute fringe white, tending to be smoky-grey at the roots. Hairs of the dorsal side of the parachute fringe brown at the tips, also grey at the roots. Parachute fringe 6 mm. in depth. The tail, which is slightly longer than the head and body, is a most remarkable adaptation of structure to function, the curious flat fringe of hairs that spreads from each side to a total width of 8 mm constituting an additional parachute plane. This flattening of the tail affects even the structure of the tail itself, for the skin on each side of the central axis is produced as a little flattened shelf from which the hairs spring. (*See* Figure 143.) (This curious adaptation is not noticeable in the dried skin.) The ears are

fairly large and oval in outline; when laid forward they reach to about the middle of the eye. The outer surfaces are clothed with hair, which, on the front part of the ear, is of the general brown body colour, but along the hinder margin is white. The inner surface naked, save for tufts of long, white, crenated hairs which spring from all the prominences of the concha. The processus antihelicis is thin and prominent, oval in outline, and it gives rise to a tuft of long white hairs. The rhinarium is naked, flesh coloured, and finely granular in texture. It is deeply cleft in the middle line. The nostrils are lateral. The eye is dark-brown. All vibrissae are extremely well developed, some of the mysticial set reaching the relatively enormous length of 27 mm. The genals are placed exceptionally far back. The ulnar carpal tuft is well marked, but the calcaneal group is not recognisable.

The manus has a naked granular palm. The striated apical pads enormous and much enlarged laterally, with a tendency to be cleft in the mid line at their free extremities. Five typical palmar pads well developed and finely striated. Claws extending to the ends of the apical pads. Digital formula $4 > 3 > 5 > 2 > 1$. Pes with naked granular soles and the usual striated plantar pads. The striated apical pads of digits 1, 4, and 5 heart-shaped, the base of the heart being directed towards the free tip of the digits. Apical pads of the syndactylous digits simple. Digital formula $4 > 5 > 2{\cdot}3 > 1$. First digit well developed, opposable to the rest of the digits, and clawless. Claws on all other digits well developed and extending beyond the ends of the pads.

FIGURE 143.—*Acrobates pygmaeus*. Enlarged drawing of a portion of the tail to show the lateral skin flanges and the lateral hair fringes.

The pouch has well marked lateral and anterior extensions, and is lined with yellow hair. Nipples four in number.

DIMENSIONS.

	Skin. ♀ N.S.W.	♀ S.A.	♀ Brit. Mus. Queensland.	♂ Brit. Mus.
Head and body	65	67	64	67
Tail	70	75	69	78
Hind foot	10	11	13	13·6
Ear	8	9	9	9

DIMENSIONS OF SKULL.

	Brit. Mus.
Basal length	18·3
Breadth	13·3
Nasals, length	7·1
Palate length	11

This beautiful little animal is not uncommon in the eastern States, but owing to its small size and nocturnal habits is but seldom observed. It is freely caught by the domestic cat. I have seen only one living example, in Victoria; but as the species extends into this State it is much to be hoped that South Australian naturalists will make it a special object of study with a view to determining its exact distribution. Of its habits little or nothing has been recorded. By Lucas and Le Souef it is said to be insectivorous, but no evidence is given in support of this assertion, and possibly it is merely a deduction from the characters of the teeth. Probably it could be kept and bred in confinement with but little difficulty, and in that way the more intimate details of its life history could be studied.

Genus 2.—DISTOECHURUS (Peters, 1874).

The only member of this Genus—the so-called Pen-tailed Phalanger— is an inhabitant of New Guinea.

Genus 3.—DROMICIA (Gray, 1841).

The members of this Genus are the beautiful little animals rather aptly named Dormouse Opossums. They are small animals with large, thin, almost naked ears. There is no parachute membrane. The tail is cylindrical and prehensile. The claws of the manus are short. Skull short and broad, bullae very large. Dentition I. $\frac{3-3}{2-2}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{3-3}{2\text{or}3}$. M. $\frac{3\text{or}4}{3\text{or}4}$. The Genus, which ranges from New Guinea to Tasmania and Western Australia, comprises four species of which one is a member of the fauna of South Australia.

Elegant Dormouse Opossum.

Dromicia concinna (Gould, 1841).

In general form like a small and elegantly built dormouse, with strikingly human, or simian, manus, and a long slender prehensile tail. (*See* Figure 144.)

The general colour warm red-brown above and white below. The fur is soft and close. The muzzle is light rusty-brown, the colour darkening slightly around the eye: the crown of the head, the whole of the dorsal region of the body, and the outer side of the limbs clothed with fine hairs 5 mm. in length, bright red-brown at the tips, and smoky-grey at the base. The muzzle below the eye, the chin, throat, whole of ventral surface of the body, and inner side of the limbs are white; the hairs being white to their roots on the ventral surface, but greyish at the roots towards the side of the body. The line of demarcation between the red-brown back and the

Figure 144.—*Dromicia concinna.* Adult female from the Mount Lofty Ranges. Natural size.

white ventral surface is sharp. The tail is about as long as the head and body, slender, gently tapering, and prehensile. The basal sixth is clothed with soft body hair on its dorsal, and to a lesser extent on its ventral surface. The remaining portion clothed with scales and naked, save for short sparse hairs which spring from the spaces between the scale rows. The scales are small, and typically some thirty-five rows are present in 1 cm. of the length of the tail. The ears are large and membranous. When laid forward they completely cover the eye. In outline they are oval, but in life they are usually carried more or less folded. They are nearly naked, only sparse short hairs being present on either surface. There is a large leaf-like processus antihelicis and a well developed bursa. The rhinarium

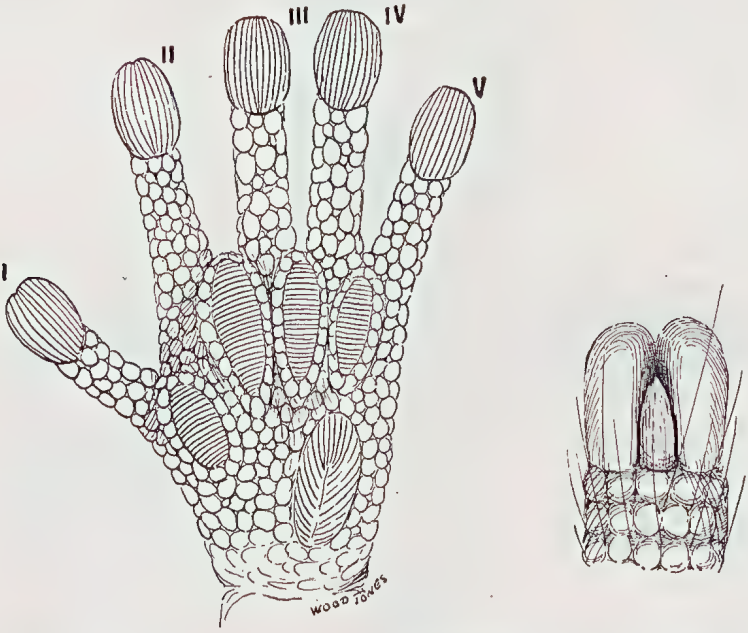

FIGURE 145.—*Dromicia concinna*. Palmar surface of left manus, ten times natural size; and enlarged view of the dorsal surface of the tip of the fourth digit.

is naked, flesh-coloured, and finely tessellated in texture; it is cleft in its entire extent. The nostrils are lateral and crescentic. The eye is black, and the long black eyelashes are well developed. Sensory vibrissae are well marked. The bristles of the mysticial set attain a length of 22 mm., and their tips reach back well behind the free point of the ear. All the typical facial groups are present, the bristles being brown in colour, with the exception of the genal and interramal sets, which are white. Upon the fore limb the ulnar carpal group is represented by three white vibrissae 5 mm. in length, and the medial antebrachial bristle is almost twice that length. A rather inconspicuous calcaneal vibrissa is also present. The manus and pes are white. The palm of the manus is granular, with five well developed and finely striated pads. Apical pads are well developed, extending well beyond the tips of the claws, and striated. The digital formula is $4 > 3 > 2 > 5 > 1$. (*See* Figure 145.) The claws on all digits are small, that on the first digit being a flat nail rather than a claw. The sole of the pes is granular, with five well developed

striated pads. The first digit is highly specialised, standing at right angles to the axis of the rest of the digits, and it is clawless. Apical pads are large and striated. They are distinctly bifid, showing a structure convergently somewhat similar to the pads of certain of the Geckos. The digital formula is $4 > 5 > 2.3 > 1$. (*See* Figure 146.) The claws of the syndactylous digits are well developed and project some distance beyond the pads. The claws of the fourth and fifth digits do not quite reach to the extremities of their pads.

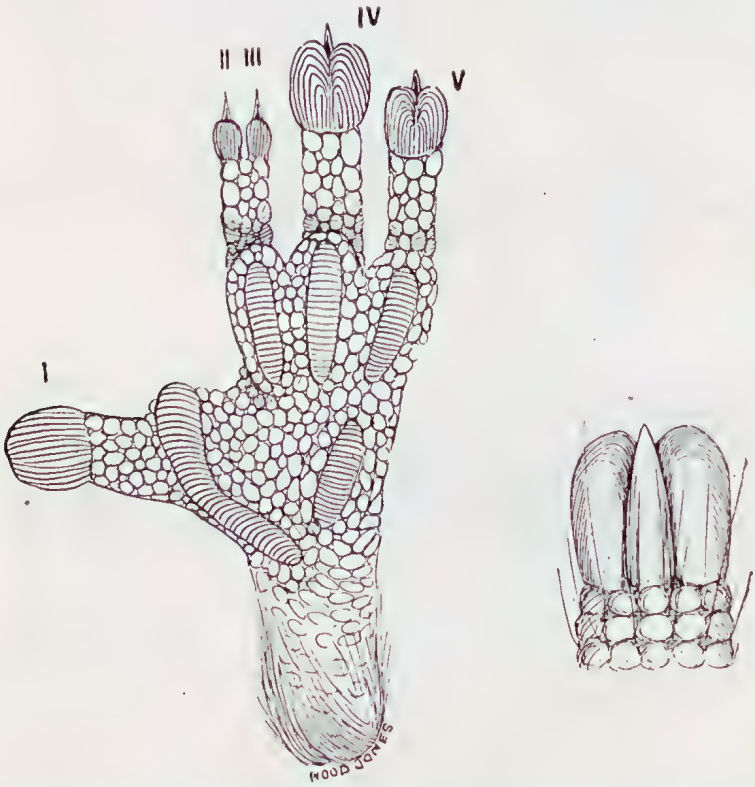

FIGURE 146.—*Dromicia concinna*. Plantar surface of left pes, eight times natural size: and enlarged view of the dorsal surface of the tip of the fourth digit.

The pouch is the shape of a conventionalised heart, the opening being at the forward end, and two lateral extensions passing forward to the side of the body in front of the legs. The nipples are six in number. The skull is broad and rounded. The bullae are very large and nearly transparent. The posterior part of the palate is perforated from the front of the first molar tooth to its hinder end.

DIMENSIONS.

	Brit. Mus. ♀ S.A.	Mt. Lofty. ♀	Kangaroo Island. ♀	Kangaroo Island. ♂
Head and body	80	90	78	77
Tail	89	83	70	82
Hind foot	12·2	9	10	10
Ear	12	13	13	13

DIMENSIONS OF SKULL.

	Brit. Mus.
Basal length	19·6
Greatest breadth	14
Nasals, length	7·5
Palate length	10·5

This beautiful little animal is apparently not very uncommon in the wooded districts of the southern portion of the State, and it is gratifying to know that it occurs on Kangaroo Island, where it enjoys the sanctuary afforded by Flinders Chase. In Kangaroo Island, as in Western Australia, it lives mostly in the tops of "Black boys" (*Xanthorrhoea*), but upon the mainland it is usually found in holes in trees, or beneath loose pieces of bark. In the Mount Lofty Ranges it occurs in the orchards. A nocturnal animal, as small as the Dormouse Opossum, usually escapes observation unless its sleeping place is accidentally discovered by day. The greatest threat to its continued existence is the presence of domestic and feral cats which, though they have assisted as collectors of many of the small marsupials, are certainly one of the most destructive agents now at work. Mr. Glauert, of the Western Australian Museum, informs me that, near Bunbury, a cat has brought over thirty specimens of *D. concinna* into the house in a few months.

The little creature makes a most attractive pet. The food is held in the very mobile hands as is the case with its larger relatives, and it thrives well on soft fruit, cakes, rose leaves, etc., in captivity. It drinks milk freely, and has a peculiar weakness for jam and for honey. It is extremely gentle, and soon becomes accustomed to handling.

It probably breeds more than once in the year, for young have been found in the pouch in January, July, and September. The number of young varies from one to six, five appearing to be about the average litter. The nest is well constructed, and is usually built behind a loose piece of bark, or in a hole in a dead branch of a tree.

Genus 4.—GYMNOBELIDEUS (McCoy, 1867).

The single species, *G. leadbeateri*, which constitutes this Genus was discovered in the scrub on the banks of the Bass River, in Victoria. It has never been reported from any other place, and since the time of its original discovery by Professor McCoy it seems to have disappeared entirely.

Genus 5.—PETAURUS (Shaw, 1791).

Four very beautiful Flying Opossums are included in this Genus. They are all small or medium sized animals, with strikingly soft and silky fur. The ears are oval, fairly large, and nearly naked. There is a well developed parachute membrane which starts upon the outer border of the fifth digit of the manus, runs along the outer side of the forearm and arm to the sides of the body, and passes down the leg to fade away upon the ankle at the base of the first pedal digit. The fifth digit of the manus, which carries the parachute membrane, is unusually well developed.

Claws are strong and sharp. The tail is long and hairy, the hair being disposed evenly all round the tail and ending as a terminal brush.

The skull is short and broad, and shows marked inflation of the bone of its hinder end. Dentition I. $\frac{3-3}{2-2}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{3-3}{3-3}$. M. $\frac{4-4}{4-4}$. Two of the species inhabit the high coastal districts of Queensland, New South Wales, and Victoria; one is confined to New Guinea and some of the islands; and one probably extends into South Australia.

Lesser Flying Opossum. Sugar Opossum.

PETAURUS BREVICEPS (Waterhouse, 1838).

Size small. Fur wonderfully soft and silky. General colour delicate grey with a soft brownish tinge. The face pale-grey. Upon the middle line of the muzzle a darker brownish dorsal stripe commences; upon the crown of the head this darker area broadens out from side to side to make a dark patch upon the middle line of the forehead. It contracts again upon the back of the neck and remains distinct, as a rule, along the whole of the dorsal surface of the body, nearly to the base of the tail. In addition to the dark dorsal stripe, the area around the eyes is also somewhat darkened, and a patch of brown hairs is present above and below the entrance to the ear. The hairs of the dorsal surface of the body are some 8 mm. long, very fine, pale at their tips, and smoky towards their bases. The hair of the upper surface of the parachute is rather rich brown in colour, darker than the general body tone, the hairs only having a minute portion of their tips pale. An even fringe of white hairs constitutes the free edge of the parachute. Outer surface of limbs is the same colour as the general body fur, or somewhat paler. Manus and pes paler, almost white. Inner aspect of limbs and whole of ventral surface white, slightly tinged with yellow or grey. Tail longer than the head and body; uniformly hairy, bushy towards the base where the hairs measure 20 mm. In colour the tail is pale soft grey in its basal portion, becoming darker and more brown for the last 60 mm., the tip itself being almost white.

The ears are large, and when laid forward they cover the eye. In outline they are oval, the posterior border, however, being less evenly convex than the anterior; they are membranous and almost naked both within and without. A well developed, flattened, processus antihelicis is present, the free edge of which is evenly rounded. The rhinarium is naked and finely granular, cleft in the whole of its extent, and forming a wide contribution to the upper lip. The nostrils are lateral and crescentric. The eye is dark-brown. Fine black eyelashes fringe both eyelids.

All the typical facial vibrissae are present, members of the mystacial set measuring 30 mm.; all are dark at the base and pale towards the tip. The ulnar carpal set is represented by three or four white bristles 10 mm. in length. The calcaneal set of vibrissae is present; two or three white bristles spring from the inner side of the ankle where the parachute membrane fades out towards the foot.

The manus shows a naked granular palm with five well developed, finely striated, pads. Apical pads are well developed and striated. The claws are long and sharp. The digital formula is $4 > 5 > 3 > 2 > 1$.

The sole of the pes is naked, save where some hair trespasses from the margins of the foot in front of the heel. There are five well developed and striated pads.

Apical pads are present and striated, claws long and curved. The digital formula is $4 > 5 > 2.3 > 1$. The first digit is well developed, opposed to the rest of the digits, and clawless. The nipples are four in number. The pouch is distinctly bilocular when containing the young, and consists of two lateral pouches extending far on to the flanks of the animal; the opening is near to its anterior extremity in the undilated condition.

DIMENSIONS.

	Skin, possibly S.A.	Victoria. ♀	Brit. Mus. Tasmania. ♂
Head and body	131	166	172
Tail	175	175	190
Hind foot	17	25	29
Ear	17	21	28

DIMENSIONS OF SKULL.

	Brit. Mus. ♀
Basal length	37
Breadth	28
Nasals, length	14·2
Palate length	21·7

Although this beautiful animal occurs in Victoria, I have no definite record of its ever having been taken in South Australia. Among the specimens in the collection of the late Mr. A. H. C. Zietz is a skin probably taken in this State, but the South Australian Museum possesses no examples known to be South Australian in origin. It thrives well in captivity and has several times bred in the London Zoological Gardens. The animal's description is included here in the hope that it will be found to be an inhabitant of the South-eastern portion of the State, and that wherever it happens to be met it will receive the protection and the study which it merits.

Genus 6.—DACTYLOPSILA (Grey, 1859).

Four very beautiful Striped Opossums which, with the exception of one Queensland form, are confined to New Guinea and the neighbouring islands, are included in the genus. One curious New Guinea species has more recently been separated into a separate Genus—*Dactylonax* (Thomas, 1910).

Genus 7.—PHALANGER (Storr, 1780).

This large Genus contains some fourteen species, and a great number of subspecies, of woolly-haired opossum-like Cuscuses. They occupy the Austro-Malayan sub-region from Celebes to North Queensland. They have the distinction of being among the most gaily coloured of the marsupials, and they display a wonderful range of individual variation in their colour and markings. None extends the range of the Genus to anywhere near the borders of this State.

Genus 8.—TRICHOSURUS (Lesson, 1828).

The animals included in this Genus are the typical Australian Opossums or Phalangers from which the Opossum fur of the world's markets is obtained. In size the animals are large. The fur is thick, close, and woolly. Ears medium or short, more or less hairy behind. No parachute membrane is present. The claws are large, curved, and strong. The palms naked and granular, with indistinctly striated pads. Soles naked in the fore part, but thickly hairy under the heels. Tail thick and evenly bushy, not tapering, the terminal portion naked below and prehensile.

Skull stoutly built, flattened from above downwards. Bullae low and but little inflated. Dentition I. $\frac{3-3}{2-2}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{2-2}{1-1}$. M. $\frac{4-4}{4-4}$. Two very variable species are contained in the Genus, and one of these inhabits South Australia.

Common or Bushy-tailed Opossum.

Trichosurus vulpecula (Kerr, 1792).

This, the commonest and most familiar South Australian marsupial, needs but little description for its recognition. (*See* Figure 147.) Nevertheless it is such a variable animal that it is necessary to describe the typical form so that varieties may be distinguished from it. The fur is thick and woolly. The general colour is

Figure 147.—*Trichosurus vulpecula.* Adult example of the typical form. One-fifth natural size.

grizzled grey. The hairs of the back are grey at the base and black at the tip, most of them having an intermediate zone of white. The individual hairs average about 22 mm. in length, and the hair shaft is usually bent at the tip, this bending of the hair producing the woolly texture of the coat. Many of the longer black-tipped hairs, at the mid line of the back, and the hinder part of the body, are perfectly

straight, and produce a more even shiny appearance in the fur of these regions. At the sides of the body the white-tipped hairs begin to predominate. The face is pale-grey, with a darker area round the eye and upon the sides of the muzzle. The whole of the dorsal surface of the body and the outer side of the limbs is uniform grizzled grey. The chin is dark. The ventral surface of the throat and body and the inner side of the limbs are dirty white, there being usually a slight yellowish-red tinge in the colour. This yellowish colour is accentuated on the chest in the males, and around the pouch in the females. The hairs of the ventral surface are grey at the bases and dirty white at the tips. The dorsal surface of manus and pes pale grey.

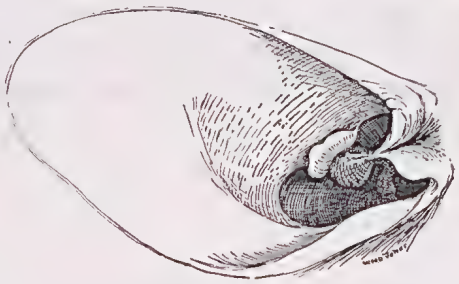

FIGURE 148.—*Trichosurus vulpecula.* Right ear. Natural size.

The tail is thick and bushy and, as a rule, about half its length is clothed with grey hair and half with black on the dorsal surface, and about one-third grey and two-thirds black upon the ventral surface. The change from the basal grey to the terminal black portion is fairly sudden. The terminal portion of the ventral surface of the tail is naked, and here the skin is finely granular, very much like the skin of the palm and sole.

The ears are long and evenly pointed at their tips. The outer side is clothed with hair basally, but the tip is nearly naked. (*See* Figure 148.) The hair at the base shows a variably sized white patch at the hinder margin. Within, the ear is nearly naked. The processis antihelicis is well marked, and a secondary process is present deeper in the proximal part of the concha. During repose the ears are carried folded.

The rhinarium is naked and pink in colour. It is wedge shaped and cleft in the mid line. In texture it is finely granulated. The nostrils are cleft and are lateral in position.

The iris of the eye is dark-brown. The eyelids are dark, and fine black eyelashes are present on both lids.

All vibrissae are well developed. The mysticial bristles are black, and measure upwards of 80 mm. in length. All the typical facial sets are present. On the fore

FIGURE 149.—*Trichosurus vulpecula.* Left manus. Twice natural size.

limb the ulnar carpal, medial antebrachial, and anconeal sets are conspicuous. On the hind limb two calcaneal vibrissae are present. The manus has a naked palm, the whole surface of which is granular, the granules being elongated. Apical pads and five palmar pads are present, the thenar pad being fused with the first interdigital. The striations on these pads, quite unlike those present in *Pseudochirus* are made, not by sculptured lines, but by a linear arrangement of the elongated granules. (*See* Figure 149.) The digital formula is $3 > 4 > 2 > 5 > 1$, or $3 = 4 > 2 > 5 > 1$. The claws are strong and curved.

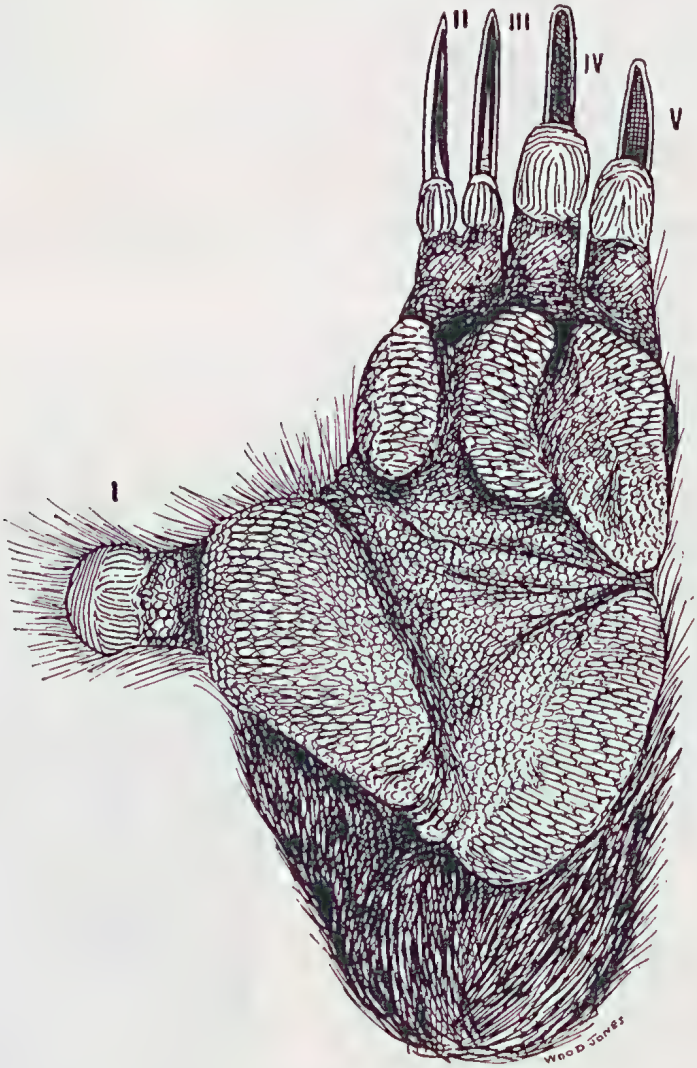

FIGURE 150.—*Trichosurus vulpecula*. Left pes. Twice natural size.

The pes is hairy under the heel. The condition of the sole is similar to that of the palm, but the striate arrangement of the granules on the pads is better marked. The pads are well developed. The apical pads are well developed and are truly striated. The digital formula is $4 > 5 > 2{\cdot}3 > 1$. The syndactylous digits bear elongated claws. The first digit is well developed, opposed to the rest of the digits, and bears no nail upon its flattened extremity. (*See* Figure 150.) The pouch is

well developed, the opening being directed forwards. The nipples are two in number.

The DIMENSIONS of the typical variety, as it occurs round Adelaide, may be taken as follows :—

Head and body	455
Tail	300
Hind foot	55
Ear	42

and the DIMENSIONS of skull as—

Basal length	70
Breadth	48
Nasals, length	30
Palate, length	40

(See Figures 151 and 152.)

In South Australia there are two well marked geographical races which differ considerably from the type. The first of these races inhabits the creeks of the Centre, living in the hollow Box trees (*Eucalyptus microtheca*) which invariably mark the line of the larger creeks and waterholes. Though universally distributed

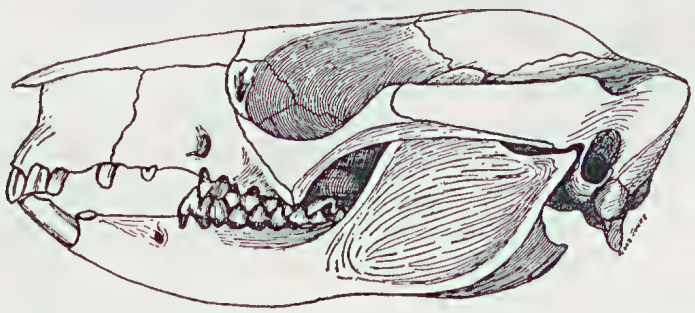

FIGURE 151.—*Trichosurus vulpecula*. Lateral view of the skull. Natural size.

along the Box creeks, it is nowhere very abundant, as it is eagerly sought out and eaten by the natives. It is typically a small form of light blue-grey colour. There is considerably less contrast in the colour of the dorsal and ventral surfaces than is present in the typical form. Little or no yellowish colouration is present on the ventral surface. The fur is close, smooth, and rather short. The black terminal portion of the tail is considerably shorter than the grey basal portion.

DIMENSIONS.

	Specimens from Longs Creek, Lake Phillipson.	
	♂	♀
Head and body	400	440
Tail	250	255
Hind foot	37	40
Ear	41	42

DIMENSIONS OF SKULL.

Basal length	64
Breadth	46
Nasals, length	26
Palate length	36

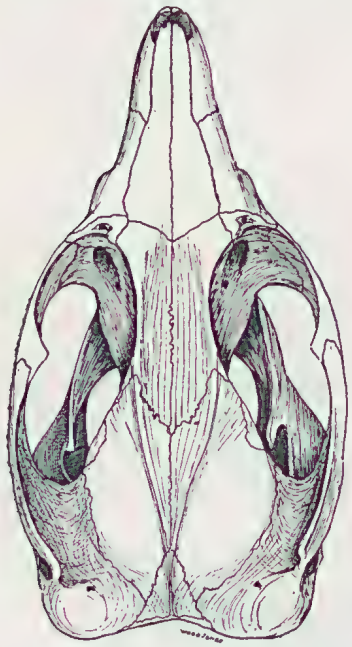

FIGURE 152.—*Trichosurus vulpecula*. Dorsal view of skull. Natural size.

The second geographical race is that inhabiting Kangaroo Island. This form lives in bush country rather than in hollow gum trees, and is distinguished by its large size, dense long fur, and tawny colouration. The dorsal surface is tawny grey. The ventral surface yellow or rusty. The white patch at the base of the ears is also yellow. The tail is almost wholly black. To a large extent it is a terrestrial animal, and is always taken in snares set in the runways among the undergrowth which are common to it and to the Wallabies.

DIMENSIONS.

	♂
Head and body	554
Tail	345
Hind foot	60
Ear	40

DIMENSIONS OF SKULL.

Basal length	83
Breadth	58
Nasals, length	36
Palate length	47

Besides these two geographical races, a very distinct melanistic variety occurs (more commonly in animals from the western districts) among the ordinary grey forms; a melanistic young being the offspring of ordinary grey parents. In this variety the fur is particularly smooth and silky. The whole of the dorsal surface is black, but the upper lip, and the patch on the back of the ear are white. The tail is black at its base and white at the tip. The manus and pes, inner side of the limbs, and ventral surface grey. The fine glossy fur and the boldly contrasted black and white colouration make this variety a particularly handsome animal.

The common Opossum may be said to be the only marsupial which is successfully adapting itself to modern conditions. The advance of human enterprise, and the closer settlement of the land have driven most of the marsupials into more and more inaccessible retreats, or have signed their death warrant. But the Bushy-tailed Opossum has become adapted to small holdings, to suburbs, and even to town life. It is as well established in Government House, Adelaide, as it is in the remote box creeks of the Centre or the dense scrubs of Kangaroo Island. It certainly holds the distinction of being the most plastic and adaptable of all its phylum and, for this reason, it is the only marsupial which may be justly described as common or abundant. Wherever sufficient native timber has been permitted to remain, so as to afford a shelter, there Opossums will be found. Moreover, the animal has adapted itself to become independent of the large eucalypti in the holes of which it has its natural home. It has learned that the space under the roof of the usual type of suburban bungalow affords an excellent shelter, and in such situations it freely takes up its residence. In this enterprise Opossums have earned the ill will of the suburban householder, as their activities are nocturnal and noisy.

They are also in ill repute, since disfiguring stains on ceilings often mark the site of their residence above, and contamination of gutters is an important thing in a place where water collected from the roof is of the utmost value. Moreover, the fondness of Opossums for rose buds, and for the fresh young shoots of vines and fruit trees renders them unpopular with the suburban gardener. Practically every man's hand is against them, and yet they survive in a surprising way right up to the limits of the town.

This adaptability is shown also in the wide range of its habitat throughout the State, and throughout Australia. Although it is a thoroughly specialised arboreal animal, it will thrive in treeless areas, and make its home in rabbit warrens as readily as in the topmost branches of giant eucalypti. This habit of living in rabbit warrens has given rise to one of the most ridiculous of Australian pseudodoxia epidemica, which argues that, since they inhabit the same warrens, Opossums and rabbits interbreed. In Kangaroo Island the Opossums live in dense low bush, and they are invariably captured in snares set on the ground in runways used equally by them and by the Wallabies. In the Centre they mostly inhabit the hollow branches and trunks of the box trees which line the sides of the creeks, and here they lie up secure from the Dingoes which will scratch all the bark from the butt of a large tree in their endeavours to bite and scratch out an Opossum safely concealed within. Although the animal shows so much resource, and so much adaptability, it must be owned that an intimate acquaintance with it produces the impression that an inoffensive and stupid simplicity is the keynote of its psychology. It is probably this simplicity which renders all Opossums more or less tame, for there is very little difference in the degree of docility between a fresh caught adult and an animal which has been born and bred in captivity. A wild male has been in the habit of paying evening visits to my captive specimens, fearlessly coming into the outhouse in which their cages are placed. This visitor would permit me to approach and stroke it, but would not allow itself to be grasped or picked up. Freshly caught animals show practically no resentment of captivity, and when placed in a temporary cage are very reluctant to leave it for a larger and more comfortable one.

When handled, even when chased and captured, they, like most marsupials, remain silent ; they will bite and scratch, and defend themselves stoutly, but as a rule they utter no cry. But though they are thus voiceless when molested by man, they are extremely noisy in their own domestic quarrels. The ordinary sound expressive of resentment, and a prelude to all encounters, is a long drawn inspiratory hiss. This hiss may die down as a harsh grunt, but when continued becomes increasingly high in pitch and may be modulated into a harsh cry, which rises to a raucous screech when the animals are fighting. During the breeding season, when fights are most common and the animals are most vocal, the male produces a curious sound like a sharp licking of the lips and a click of the tongue. So far, I have not heard a female produce this sound. The cry of the young, when removed from the mother, is extremely loud and quite peculiar, and can be described best by saying that it is so like the voice of the common South Australian tree frog that it is almost impossible to distinguish it from the frog's voice.

In fighting among themselves the Opossums use the claws of the manus far more than the teeth, and although they often inflict scratches on each other and remove quantities of hair, even the noisiest encounters usually result in no great damage to the opponents.

Although the common Opossum has been spoken of as an abundant and an adaptable animal, it must not be imagined that it is one that stands in no need of legislative protection. Any creature which has a pelt of commercial value must needs be protected by legal enactments to prevent its utter extermination. The Australian fur trade has the distinction that it is utterly destructive, the animals whose pelts are marketed are not bred or artificially protected in captivity, they are wild animals slaughtered for their pelts. The most valuable furs in the world's markets—those of certain of the foxes—are derived from animals bred in captivity. This fur trade is a conservative one ; the race is kept alive by man's agency in order to supply fashion's demands. But the Australian market is supplied by the slaughter of wild animals—it is a destructive trade, and takes no regard for the conservation of the fur-bearing animal. Legislative enactments for the protection of Australia's fur-bearing animals are therefore absolutely essential. In 1920 the Opossums of South Australia were removed from the protected list from June to September, and in that interval over 100,000 Opossums were killed for the fur trade. Between one and two million pelts of Australian Opossums are marketed every year. In the fur trade the skins of *Trichosurus* pass not only as Opossum, but as " Skunk " (when sheared and dyed) and as " Beaver " as well as " Adelaide Chinchilla."

The breeding season is in June. In this State there is no doubt that the animal breeds normally only once, though it is commonly asserted to breed twice, in the year. It is to be noted that the breeding season is the legalised " open " season in those places in which an open season is declared. That an " open " season should coincide with the breeding season is an anomaly in protective legislation which probably has no parallel in attempts at regulating the slaughter of fur-bearing animals. The animals begin to breed in the year following that in which they are born. Before the young is born the female constantly examines and licks out her pouch, and when the embryo is within it is the object of her constant attention. September 20th is the average date on which the young leave the pouch in Adelaide, and the young animal is a curious creature with a dark-brown dorsal and a bright

yellow tan ventral surface. The young animal becomes independent of its mother during November. During December it gains its grey woolly coat, and by the end of January it is practically full grown. It is usually said that four nipples are present in the female *Trichosurus*. It is well known that the number of nipples is subject to considerable variation in several Australian marsupials; no specimen of *Trichosurus* that I have so far examined has had more than two. It is also often said that two young are produced at a time. I have handled a very large number of embryos and so far have not met with a case in which more than one was present.

Sub-Family III.—TARSIPEDINAE.

The Sub-family contains but a single Genus and species, *Tarsipes spenserae* (Gray. 1842). This beautiful little animal is one of the most specialised marsupials, The extensile tongue and degenerate cheek teeth are obviously modifications begot by the demands of a specialisation of diet. *Tarsipes* appears to be a mammalian nectar-sucker, and the long tongue has undergone its great specialisation in order to obtain nectar by its insertion into flowers, after the fashion common among birds and insects. It is also said that it will eat the soft parts of insects, and feed in captivity by thrusting its long tongue into "sopped bread made very sweet with sugar" (Gilbert). It is a rare animal, most usually seen after its destruction by a cat, and it is confined to Western Australia.

Family II.—MACROPODIDAE.

As we have previously noted (p. 172) the *Macropodidae* constitutes the second great division of the *Syndactyla diprotodontia*, and contains the assemblage of the Kangaroos, Wallabies, and the smaller animals, which, exhibiting the same general type of structure, are known as Rat Kangaroos. In all these animals the hind limbs are characteristically long, the fore limbs being, by comparison, extremely under-developed. The *Macropodidae* are typically saltatory animals, and, but for the curious exception of the Tree Wallabies, are terrestrial. The pouch is well developed ; its opening is at the front, and the nipples are four in number. There are five digits on the manus, but the pes lacks the first digit in all members of the Family except the very aberrant " musk rat " (*Hysiprymnodon*) of Queensland. A very large number of species is contained in the Family, and the grouping of all the forms into Sub-families and Genera is a matter of some difficulty. Unfortunately, many members of the Family have become extinct in recent years, and descriptions cannot be written from living animals or even from preserved specimens. In these cases the descriptions are taken from previously published accounts, and it is of some importance to discriminate between accounts written from recent animals and those founded on the examination of long preserved skins, for the colours of all members of the Family fade in a remarkable manner when long exposed to light, and in some cases alter very soon after death.

It is obvious that *Hysiprymnodon* needs separation from the rest of the *Macropodidae*, and this animal, which shows some very well defined linkages with the *Phalangeridae*, is placed by itself in a Sub-family of its own. The remaining members of the Family may be separated into two fairly clearly defined groups, the one containing the Rat Kangaroos—Sub-family *Potoroinae*, and the other comprising the Wallabies and Kangaroos—Sub-family *Macropodinae*.

Of these three Sub-families the *Macropodinae* are obviously the most specialised, and the *Hypsiprymnodontinae* most primitive ; the *Potoroinae* being almost certainly derived by descent from the latter group, but not certainly ancestral to the *Macropodinae*.

The sub-division of the Family is effected upon the following structural basis :—

(A.) First pedal digit present. Tail naked and scaly.

Sub-family 1. *Hypsiprymnodontinae.*

(A^1.) First pedal digit absent. Tail hairy.

(B.) Size small. Ears small and rounded. Claws of manus very large. Canine teeth present.

Sub-family 2. *Potoroinae.*

(B^1.) Size usually large Ears large and pointed. Claws of manus not very large. Canine teeth usually absent.

Sub-family 3. *Macropodinae.*

Sub-Family I.—HYPSIPRYMNODONTINAE.

This Sub-family contains only a single species, the curious animal discovered by Dr. E. P. Ramsay in 1874, and described under the name of *Hypsiprymnodon moschatus*.

It inhabits the dense damp scrub which fringes the banks of some of the Queensland rivers. It is commonly known as the " musk rat," and is an animal which is very rarely met with even in the comparatively restricted area of its natural habitat.

Sub-Family II.—POTOROINAE.

The members of this group are small kangaroo-like animals known as Jerboa Kangaroos, Rat Kangaroos, or sometimes, and less correctly, as Kangaroo Rats. The claws of the manus are very large, those of the median digits being disproportionately long when comparison is made with the lateral digits. The tail is long and hairy. The ears are small and rounded.

Canine teeth are present, and the upper central incisors are far larger and longer than the other upper incisor teeth. The *Potoroinae* is perhaps the most difficult group of the Australian Didelphia to deal with from a systematic point of view. It is also a group which, alas, cannot be much further elucidated by the proper study of any sufficient series of preserved specimens in Australia. The amount of preserved material in our Museums is totally inadequate for a comprehensive survey on modern lines ; and several species have been completely exterminated without any proper study having been made of them either alive or dead. The Sub-family is conveniently split up into Genera as follows :—

(A.) Upper premolar teeth marked by six or more deep grooves.

(B.) Palate nearly complete. Bullae but little inflated. Rhinarium partly hairy. Genus 1. *Aepyprymnus*.

(B^1.) Palate with large vacuities. Bullae markedly inflated. Rhinarium naked. Genus 2. *Bettongia*.

(A^1.) Upper premolar teeth marked by less than six shallow grooves.

(C.) Hind foot longer than the head. Canine teeth minute. Genus 3. *Caloprymnus*.

(C^1.) Hind foot shorter than the head. Canine teeth well developed. Genus 4. *Potorous*.

Genus 1.—AEPYPRYMNUS (Garrod, 1875).

The only animal contained in this Genus is the largest of the Rat Kangaroos, and is confined to New South Wales.

Genus 2.—BETTONGIA (Gray, 1837).

Various names have been given to the animals comprised in this group ; they have been termed Bettongs, Jerboa Kangaroos, Prehensile-tailed Rat Kangaroos, or simply Rat Kangaroos or Kangaroo Rats by various writers. Certain of them have had the local familiar name of Squeakers conferred on them ; and by the South Australian aboriginals they are termed Tungoos in the only part of the State in which they appear still to exist. In Western Australia they are sometimes known by the name of Bodie Rats, but this term appears to be one of rather varying connotation. The rhinarium is naked and flesh coloured. The ears are short and rounded. The claws of the manus are large. The hind feet are longer than the head, and their soles are naked and granular. Among the generic external characters usually included are those of a crested and somewhat prehensile tail ; these two

characters are, however, lacking in the only species of whose present existence in this State I have any definite evidence. The skull is stoutly built. Palate with large vacuities between the rows of molar teeth. Dentition I. $\frac{3-3}{1-1}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{2-2}{2-2}$. M. $\frac{4-4}{4-4}$. The premolar teeth are remarkable structures, the tooth present in the adult being enormously elongated and fluted upon its surface in a very remarkable manner. The number and condition of the molar teeth is very variable. Three skulls of *B. penicillata* in my possession show molar formulas as follows :— (A) M. $\frac{5-5}{5-5}$, (B) M. $\frac{4-5}{4-5}$, (C) M. $\frac{4-4}{4-4}$, and in the last skull the fourth molars are mere vestiges.

The different species of Tungoos are particularly difficult to discriminate, and it is much to be regretted that animals, which were extremely abundant not many years ago, have not been studied more exactly, or their remains preserved in greater numbers in Australia.

Four recognised species are contained in the Genus, and two of these are, or have been, represented in this State. One species still lingers in certain districts, but is not likely to survive for long. Upon St. Francis Island in the Great Australian Bight there was an animal which was almost certainly a species of *Bettongia*. This creature has been exterminated in recent years, since its presence was considered undesirable by the settlers, and of it not a trace remains.

KEY TO THE TWO RECOGNISABLE SOUTH AUSTRALIAN SPECIES.

External characters—

(A.) Tail clothed with short hair, scarcely crested, not prehensile, usually white at the tip. (1) *B. lesueuri.*

(A^1.) Tail crested on its dorsal surface in its distal portion, said to be prehensile, usually not white at the tip. (2) *B. penicillata.*

Cranial characters.—

(A.) Upper premolar more than 7·5 mm. long, its long axis in line with the rest of the teeth. Bullae large, reaching upwards of 12 mm. below the level of the glenoid fossa. Snout region short ; skull strongly ridged. (1) *B. lesueuri.*

(A^1.) Upper premolar less than 7·5 mm. long, its long axis deflected outwards in front. Bullae smaller, reaching only about 11 mm. below the level of the glenoid fossa. Snout region long ; skull little ridged, smoothly rounded. (2) *B. penicillata.*

Although the external characters are so variable, and form such comparatively inconclusive guides to the species, the cranial characters and dental distinctions are well marked. Moreover, the physiological distinctions between the two species are even more pronounced. *B. lesueuri* is a burrowing animal, living, as a rule, in rabbit warrens ; while *B. penicillata* constructed a nest in a hollow scratched in the ground. *B. lesueuri* is a rather intractable creature and a fierce fighter, while *B. penicillata,* judging from such accounts as have been published, seems to have been a docile and gentle animal.

1. Lesueur's Rat Kangaroo.

BETTONGIA LESUEURI (Quoy and Gaimard, 1824).

This animal, referred to in most works on Australia as Gray's Rat-Kangaroo, is, so far as I can ascertain, the only species still living in South Australia ; moreover, it is the only one of which a skin or a mounted specimen has been preserved in our State collection.

In certain districts it is still by no means rare, but its decrease in numbers has been so rapid during the past twenty years that probably the remnant still existing must not be regarded as a very long lived one.

The animal may be described as being shaped on the whole like a little stoutly-built kangaroo, as being about the size of a rabbit, with a short blunt head and little round erect ears. In general colour it is yellowish-grey, the ventral surface being lighter, and the manus, pes, and tail distinctly more yellow. The head is blunt, the face is greyish-yellow, becoming more markedly yellow upon the lips and cheeks. (*See* Figure 153.) The hair of the dorsal surface is 21 mm. in length. The root of each hair is white, then follows a smoky-grey portion, which again gives

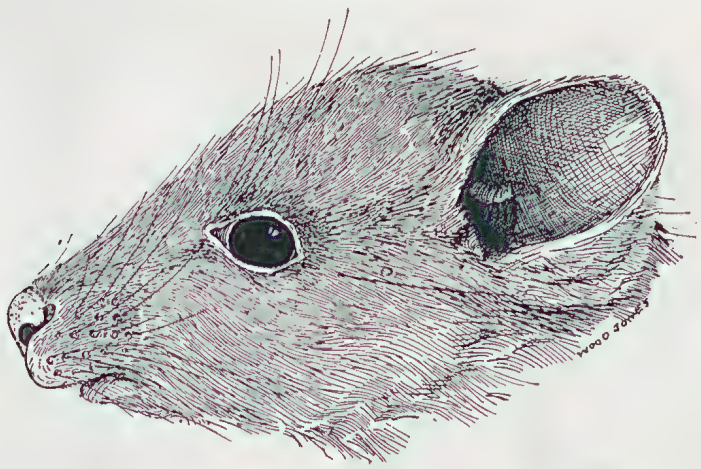

FIGURE 153.—*Bettongia lesueuri.* Characters of the head; from an adult male South Australian specimen. Three-quarters natural size.

place to yellowish-white, and the tip itself is black. Upon the sides of the body the black tips are shorter, and on the ventral surface they are absent, the colour of the fur being there conspicuously yellow. Gould noted many years ago that the coat colours of many marsupials faded in a rather remarkable manner, and that skins which had been displayed in museums often gave a very false idea of an animal's true colouration. In the case of *B. lesueuri* the fading of the yellow colouration is very remarkable, and it is therefore difficult to estimate the true specific nature of coat colour when the descriptions are written from a collection of preserved skins.

The instability of this yellow colouration is also shown by the fact that it is removed by the action of alcohol used in the preservation of specimens.

The manus and pes are clothed with short yellow hairs upon their dorsal surface. The tail is shorter than the head and body ; it is clothed with short yellow hairs,

which are longer on the dorsal and ventral surfaces than they are on the sides, but no distinct crest is developed. In some specimens the tip of the tail is white, but in some it remains yellowish throughout. This variation in the colour of the tip of the tail does not appear to depend upon age, sex, or district. The tail of the living animal affords no indication whatever of being prehensile.

The ears are short and rounded. They are clothed with short yellowish fur upon their outer surfaces, and are naked within. Below and behind the ear there is a rather distinct tuft of soft yellowish hair, rather like the tuft behind the ear in some of the *Phalangeridae*. The processus antihelicis is present as a curved elevated ridge; a smaller process is just recognisable distal to the main process. The ear is carried well away from the head, and is not folded during sleep. The rhinarium is naked, tessellated in texture, and pink in colour; it is continued to the upper lip, which is deeply cleft in the mid line.

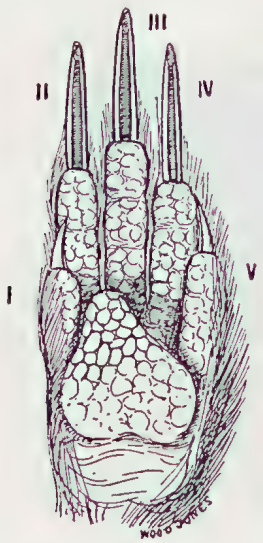

FIGURE 154.—*Bettongia lesueuri*. Palmar surface of left manus. Twice natural size.

FIGURE 155.—*Bettongia lesueuri*. Plantar surface of left pes. Natural size.

The eye is black. The eyelashes are short and black, and they are scanty in number. The facial vibrissae are fairly well developed, all sets being represented. The supraorbital vibrissae form a group of three or four, of which one is the longest (45 mm.) of all the facial bristles. The mysticial set is arranged in five rows, and the longest vibrissa is 35 mm. All the facial vibrissae are black. One white ulnar carpal vibrissa, 15 mm. long, is recognisable in the adult.

The manus has a naked, granular palm; there is a single central granular pad of a somewhat irregular shape. (*See* Figure 154.) The claws are elongated, that of the third digit being the largest. The digits are hairy to their tips on the dorsal

surface, the hair extending over the base of the claws. The digital formula is $3 > 2 > 4 > 5 > 1$. The elongated pes has a coarsely granular sole, the granules being horny and scale-like. (*See* Figure 155.) The sole, with the exception of the

FIGURE 156.—*Bettongia lesueuri.* Skull of an adult. One and a half times natural size.

pad at the base of the enlarged fourth digit and the heel, is covered by the long stiff yellow hairs which grow under the sole from the margins of the foot. The digital formula is $4 > 5 > 2{\cdot}3$.

The pouch is well developed, the opening is at its anterior end.

The nipples are two in number.

The skull is stoutly built. (*See* Figures 156 and 157.) It is broad and flattened, and in its general appearance it is somewhat reminiscent of the skulls of certain of the *Phalangeridae*. The muzzle region is short; the top of the skull between the orbits is flat and sharp-edged. The suture line at the posterior ends of the frontal bones is singularly variable; it may run straight from side to side; it may be gently curved, convex backwards; or it may be acutely angulated with the apex in the middle line at the back. All these varieties may be seen in skulls collected from one very limited area. The bullae are enormous, and so thin as to be semi-transparent. The permanent premolar tooth is a very extraordinary structure, and it exceeds the combined

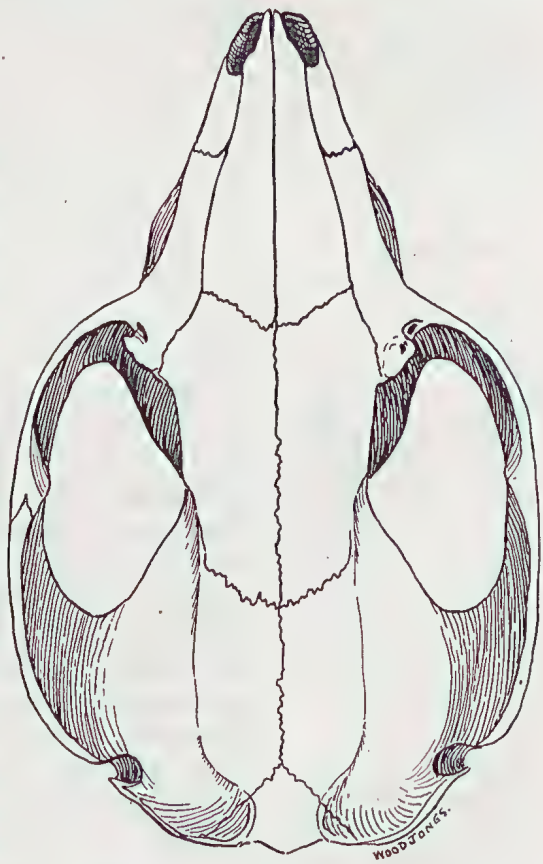

FIGURE 157.—*Bettongia lesueuri.* Dorsal view of the skull of adult. One and a half times natural size.

lengths of the two molar teeth placed immediately behind it, and its long axis is in line with theirs. (*See* Figure 158.) The grooves upon its surface are deeply sculptured. The molar teeth are very variable in number and in size, the hinder members of the series being especially inconstant in their characters.

DIMENSIONS.

	Typical ♂ from Lake Phillipson.	Brit. Mus. W.A.	Brit. Mus. W.A.
Head and body	370	457	420
Tail	300	290	260
Hind foot	105	103	98
Ear	40	29	30

It will be noticed that the animal at present living in South Australia is considerably smaller than the typical Western Australian form. Moreover, it possesses a tail, a hind foot, and an ear which are relatively considerably longer.

DIMENSIONS OF SKULL.

	Lake Phillipson.					Brit. Mus.
Basal length	64	68	62	62	59	64
Breadth	45	46	43	42	41	45
Nasals, length	27	28	25	26	25	26·5
Palate length	36	—	35	34	34	40
Bulla below glenoid fossa	19	18	—	16	18	—
Premolar length	8·5	9	9	9	—	9·6

This Rat Kangaroo, which is probably the only living representative of the Sub-family left in South Australia, is still existing in some numbers in certain districts in the North-West. Here it lives in company with the rabbits, sharing the larger warrens with them, and preferring the warrens constructed amongst the sand ridges of the typical sand hill and claypan country. The choice of a warren seems largely to be determined by the quantity and nature of the herbage in the neighbourhood, for in these waterless districts Rat Kangaroos are dependent on the succulent sand hill vegetation. Rabbits are so universally spread over the country that there probably does not exist to-day a *Bettongia* colony living in its own burrows. It has thrown in its lot with the rabbit, and although it appears to have its own appartments in the complicated system of the large warrens, it is merely a tenant, forming a part of a community in a manner which is rather remarkable when its exceedingly pugnacious character is considered. Nevertheless, though it lives in apparent harmony with the rabbits, and avails itself of the shelter of their burrows, it is suffering for the partnership. The

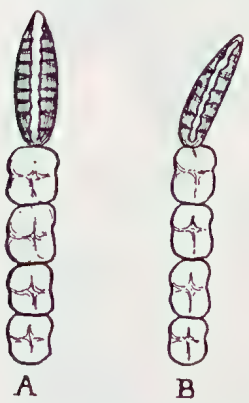

FIGURE 158.—Diagram of the upper cheek-teeth of the left side, A. of *Bettongia lesueuri*. B. of *Bettongia penicillata*. Note the outbending of the premolar tooth in the latter.

remnant of the Tungoos is living in an environment in which there is a severe competition for succulent food. In good seasons there is enough juicy herbage for cattle and rabbits as well as Rat Kangaroos but in bad seasons the rabbits and the marsupials perish in large numbers. Such losses among the rabbits are soon made good, but with the marsupials this is not the case, and probably the end of the Tungoo is not far off. When times are bad, and when the cattle and rabbits have eaten all the herbage of the sand hills, the Tungoos become extremely bold, and will enter a homestead in their search for anything to eat. They will come into a room and boldly face a cat in order to obtain some potato peelings; they will scramble over a paling fence four or five feet high in order to get at the vegetable garden. They are bold and enterprising little animals which have made, and are making, a brave struggle against what seems an almost inevitable extermination. In the more cultivated districts of the South, where food is in plenty, the wholesale scattering of poisoned pollard has led to their complete extinction. The poison cart has done its deadly work on the slowly-breeding Tungoo, although the rapidly-breeding Rabbit has survived the ordeal. In the North they are steadily being pressed out of existence by the competition for food.

When we remember that their numbers in rabbit warrens, even near to towns, was a source of constant annoyance to rabbiters less than twenty years ago, we can realise how destructive to the native herbivorous fauna the wholesale spreading of poisoned grain has proved to be. Nor must we forget that the remnant which still struggles on in the North is now exposed to the ravages of the fox.

Tungoos are strictly nocturnal, and although they are gregarious in the sense that more than a single pair may inhabit a large warren, they do not live at the present time in what could be termed communities. Although the examination of their tracks on a sandhill might lead one to suppose that a very large number of animals inhabited the district, it will usually be found that the multiplicity of tracks is the product of, maybe, no more than a single pair. When the animal is hopping in rapid gait, the track consists merely of the print of the two long hind feet, but when it is feeding there is added the continuous, tortuous, impression of the tail. These tail tracks of the Tungoo have often been taken as indications of the presence of snakes, and at first sight the twisting marks upon the sand may easily be misinterpreted.

The animals are extremely cautious, and a considerable amount of patience exercised in watching warrens on moonlight nights has not been rewarded with the sight of the creatures living their natural life. The only way to obtain living examples is a systematic excavation of the extensive warrens in which they live. Some idea of the difficulty involved in this may be gathered from the fact that, on one occasion, it took three men, in the neighbourhood of McDouall's Peak, more than a day to obtain a single specimen from a complicated warren from which six rabbits were dug out before the Tungoo was met with. They are hardy; five specimens obtained in the North-West travelled 650 miles by varied conveyances, and spent three weeks on the trip, within the confines of a box in which there was little spare room. They all arrived well in Adelaide, and thrived and reproduced in captivity. In confinement their whole activities are at first directed towards escape, and to effect this they will gnaw through wood, break through wire netting,

and dig under or climb over most obstacles. When handled, they frequently evince resentment by hissing, but when suddenly startled, and often when starting on their evening activity, they produce a short, sharp, grunt, which is an altogether surprising and unexpected sound which seems quite unsuited to the animal which produces it.

The males and females differ considerably in disposition, the males being wild and pugnacious, the females considerably more docile. A female may, as a rule, be readily handled ; but a male will bite and scratch with some severity if an attempt be made to pick him up. Even if kept in large runs when in captivity the males will fight to the death. The method of fighting is exactly like that which is employed by Bandicoots, one animal pursuing and scratching the fur from the other as it jumps over it. In this way the victim is worn out ; and, plucked of its fur, and scored by deep furrows produced by its rival's strong claws, it dies of exhaustion.

The usual position of repose is a sitting, hunched-up posture, often with the tail brought forward between the legs after the fashion of some of the wallabies. They drink little, if any, water in captivity, and thrive on any green stuff, roots, and biscuits.

They are extremely alert, and seem to be always awake, and both hearing and vision appear to be extremely keen. One young is produced at a time, and it leaves the pouch in November, after a pouch life of nearly four months. They breed freely in captivity, and could readily be re-established in sanctuaries.

2. Tufted-tailed Rat Kangaroo. Squeaker.

Bettongia penicillata (Gray, 1837).

Bettongia ogilbyi (Gould, 1841).

As far as can be ascertained at present, this animal seems to have disappeared from South Australia. It is possible that it may prove to be still living somewhere in this State, and if there is any hope of such a survival it would seem that the South-East or the extreme North-East holds out the greatest promise.

Not only does it appear to have died out completely over the greater portion of the State, but no specimen of the South Australian form seems to have been preserved in the zoological collections in Australia. At present, so far as this State is concerned, the race is represented only by some half-dozen skulls. Since it is only recently that the specific distinctions of several South Australian species have been recognised as marking them off from the allied forms of the eastern and western States, this absence, in Australia, of specimens from this State is the more to be regretted. The animal described by Gray as the type of the species *Bettongia penicillata* came from New South Wales ; and there are some grounds for supposing that the South Australian animal, distinguished by Gould as *Bettongia ogilbyi* (since merged with *B. penicillata*), did not exactly conform to the type from New South Wales. In the absence of any specimens of the South Australian form from which a description may be written, I shall quote the original description of *B. ogilbyi* from Gould, with notes from the later works of Waterhouse and of Krefft ; preferring this to giving a description of the still-existing animal from New South Wales.

Size smaller than Lesueur's Rat-Kangaroo, the weight of the animal being about three or four pounds. ~~Fur dense, the under-fur very abundant~~, soft, long, and woolly. General colour brown, obscurely washed with yellow on the sides of the face and body; under-surface of the body dirty yellowish-white. Ears clothed with yellow hairs. Pes brown, darkest on the sides, especially of the toes. Manus paler brown. Tail well clothed, a very small portion of the base covered with fur, like that of the body; beyond this and extending to about the middle of the tail, the hairs are of a rusty hue on the upper side and a very pale-brown on the under side. The apical half of the tail is clothed with black hairs, which vary from 15-20 mm. in length, those nearest the tip being the longest. On the sides of the tail the hairs are comparatively short, and, excepting at the tip, they are of a deep-brown colour. On the underside of the apical half of the tail the hairs are longer than on the sides, and are of a black colour. The hairs of the dorsal surface of the body are rather broadly annulated with pale rusty-yellow, sometimes rusty-white, and at the point they are blackish-brown; the longer interspersed hairs are black. The fur, both of the upper and under parts of the body, is grey at the base.

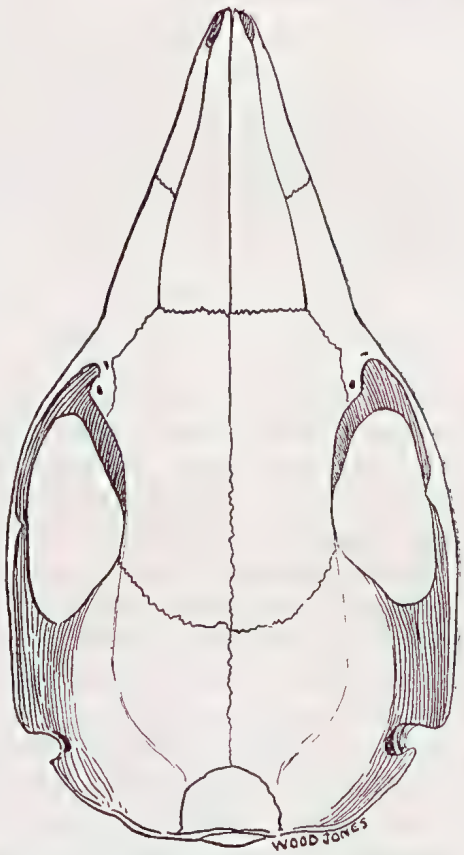

FIGURE 159.—*Bettongia penicillata*. Dorsal view of the skull of an adult. One and a half times natural size.

The skull is lightly built and delicate; the muzzle region is long and narrow, the posterior margins of the nasal bones square. The whole skull smoothly rounded without marked ridges. (*See* Figure 159.) The bullae are large, their lowest point being some 10 mm. below the level of the glenoid fossa. The upper premolar is about 7 mm. in length, its axis bent outwards from the line of the cheek teeth in front; it is marked by seven or eight grooves.

DIMENSIONS.

	Skin. Brit. Mus.
Head and body	390
Tail	310
Hind foot	108
Ear	25

DIMENSIONS OF SKULL.

	S.A.	S.A.
Basal length	61	61
Breadth	38	39
Nasals, length	27	28
Palate length	36	36
Distance of bulla below glenoid fossa	11	11

Only a few years ago this animal was extremely common over the greater part of South Australia. Twenty years ago the dealers in Adelaide did a great trade in selling them by the dozen at about ninepence a head for coursing on Sunday afternoons. It may surprise people who remember those days to know that there is not a preserved specimen, not even a skin of the animal, available for scientific study in South Australia to-day. In the same way it will one day surprise the rising generation when they realise that the few native animals they are now familiar with are gone for ever.

The Tufted-tailed Rat-Kangaroo constructed nests of grass and sticks, which were, as a rule, concealed beneath the surrounding vegetation, and therefore difficult to detect. Often the nest was constructed beneath the dependent leaves of a Blackboy (*Xanthorrhoea*), and the nest was occupied either by a single animal or by a pair.

The curious feature connected with the animal's nesting habits was the fact that it was said to carry the grass with which its nest was constructed by curling the tip of its prehensile tail around a wisp. Gould figures the animal thus employed, and states that he had observed them performing the same action in captivity. I know of no more recent observations upon this prehensile action of the tail. Like the Bandicoots, the Rat-Kangaroos always covered up the entrance to the nest, thus making the detection of their home more difficult.

They were wonderfully nimble animals, and Krefft records seeing one get over a close palisade fence 8ft. in height; but they were not very fast, and were easily caught, even by "common dogs."

It is much to be hoped that, should some remnant of the South Australian race be found still living in the more bush-covered portions of the South or of the North-East, steps will be at once taken that it may be preserved and protected by every possible means.

3. St. Francis Island Rat Kangaroo.

Upon St. Francis Island in Nuyts' Archipelago there lived, during the time of the present occupiers, large numbers of what was evidently a species of *Bettongia*. Since the mammalian fauna of the islands of the Bight has proved, in so many instances, to exhibit distinctions from the types inhabiting the mainland, it is worth while recording what can still be ascertained concerning this interesting and recently exterminated animal.

When the island was first settled, some forty years ago, "Rat-Kangaroos," or "Tungoos" were swarming. The animals do not seem to have formed burrows, but they lived in the undergrowth, and used frequently to hop into the homestead to

take bread or other eatables thrown to them from the table. They do not appear to have been nocturnal; they do not seem even to have been afraid of the human invaders of the island. Their only offence seems to have been that they had a liking for the garden produce of the family who settled on the island.

Cats were introduced in order to exterminate the Tungoos, and their work has been done completely. To what species the animal belonged can never be known and the fact of its extermination in this manner is much to be regretted.

There are many islands in the vicinity of St. Francis to which some members of the original colony could have been transported, and so given a chance to survive.

The story is one of importance from the point of view of legislation for the protection of insular faunas, since it demonstrates clearly how rapidly and how completely an interesting island fauna may be destroyed and lost to science for ever.

It is much to be hoped that *Isoodon nauticus*, *Petrogale pearsoni*, *Thylogale flindersi*, *Leporillus jonesi*, and *Rattus murrayi* are not permitted to follow the Tungoos of St. Francis Island into the ranks of recently exterminated animals.

Genus 3.—CALOPRYMNUS (Thomas, 1888).

This Genus was created by Oldfield Thomas for the reception of the animal termed the Plain Rat-Kangaroo by Gould. The Genus contains only one species and is separated from *Bettongia* and the other allied Genera by the peculiarly broad and flattened form of the skull and by certain dental peculiarities.

Plain Rat-Kangaroo.

Caloprymnus campestris (Gould, 1843).

The following description is taken from previously published accounts:—

General form slender and delicate. Face peculiarly broadened between the orbits, and the head short. Fur very long and soft, under-fur thick and abundant. General colour a distinct pale ochreous yellow, but pencilled with black; darker on the back and brighter on the sides. The hairs of the back are grey at the root, yellow in the middle, and then blackish, followed by a long yellowish-white interval, the tip being black. Under-fur slate coloured at base, then dull sandy, the tips being brown on the top of the head and centre of the back, rich sandy rufous on the sides, it being the colour of the under-fur that gives the prevailing sand rufous tone to the whole animal. The chin, sides of the chest, and abdomen pale sandy white, centre of chest naked in all the specimens examined, and apparently glandular. On the ventral surface the fur is grey at the base and yellowish-white at the tips, but on the lower part of the abdomen the grey is lacking. The upper lip is white. Fore and hind limbs bright yellowish rufous. Manus brownish-white, pes yellowish-white. Hairs of manus and pes short, not hiding the claws. Claws of manus long and white. The rhinarium is naked and broad. The ears are short and rounded and well clothed with yellowish-white hairs internally, and brown hairs externally except at the base behind, where they are white. The tail is moderately long and slender, sparingly clothed with pale hairs on its upper surface and at the sides. Through the short hairs of the upper surface scales are visible. On the under side of the tail the hairs are more dense, harsher and brownish-white in colour.

The skull is remarkable for the peculiarly short broad muzzle, with large and enormously wide nasal bones. In this feature it differs from any other marsupial skull. The last premolar shorter than that of *Bettongia*, and with only a few shallow grooves placed vertically. The molars more complex than those of *Bettongia* and more nearly resembling those of *Aepyprymnus*.

DIMENSIONS.

	♂ Brit. Mus.
Head and body	440
Tail	360
Hind foot	121
Ear	31

DIMENSIONS OF SKULL.

	♂ Brit. Mus.
Basal length	59
Breadth	41·5
Nasals, length	34
Palate length	37
Premolar length	6

The history of the Plain Rat Kangaroo is a remarkable one. It was first described in 1843 by Gould, and by him it was said to live on the stony tablelands and open plains of the northern part of South Australia. The three specimens collected by Sir George Grey, which Gould described, are in the British Museum, the skull of the oldest individual being figured both by Waterhouse and by Oldfield Thomas. There is no hint in Gould's work that the animal was a rare one, but the remarkable fact concerning it is that it has apparently never been collected since. There is no trace of the animal in any Museum in Australia, and no further specimens have ever been received by the British Museum. The probability is that it has become extinct, and that three skins and skulls are all that remain of one of South Australia's most remarkable animals. *Caloprymnus campestris* furnishes yet another example of an animal which has probably passed away comparatively recently without any trace of it having been preserved, not only in the Museum of its own State, but in any scientific institution in Australia.

Genus 4.—POTOROUS (Demarest, 1804).

The Rat-Kangaroos contained in this Genus are small creatures and considerably more rat-like than the members of the other genera of the Sub-family. The hind limbs are comparatively short, and thereby the likeness to the kangaroos is largely lost. The rhinarium is naked. The ears are short and rounded. The claws of the manus are long, slender, and gently curved. The claws of the third and fourth digits are far longer than those of the others. The tail is uniformly clothed with short closely adpressed hairs, and has no crest. Dentition I. $\frac{3-3}{1-1}$. C. $\frac{1-1}{0-0}$. P.M. $\frac{2-2}{2-2}$. M. $\frac{4-4}{4-4}$. Three species are contained in the Genus, and the history

of them is remarkable. *Potorous gilberti* and *P. platyops* were discovered in 1840 by J. Gilbert, who collected for Gould. Both species were captured in the neighbourhood of King George's Sound, Western Australia, and neither has been recorded since. The third species, *P. tridactylus*, which is still present in Tasmania, is said to have also been an inhabitant of South Australia. Unfortunately there is at the present time no living member of the Genus in South Australia, nor is any preserved material available of the form which is said to have lived in South Australia available for description or study. The description of the species which at one time inhabited this State is therefore taken from previously published accounts supplemented by examination of the still-surviving Tasmanian form.

Potoroo or Common Rat-Kangaroo.

Potorous tridactylus (Kerr, 1792).

The name "common" Rat-Kangaroo although that used in all books dealing with the marsupials, is a sadly inappropriate one. If the animal has a familiar name, the one by which it should be known is Potoroo, this being the name employed by John White, Surveyor-General of the settlement of New South Wales (1790), and by John Hunter, who studied the anatomy of the specimens which White collected and sent to London; and this, being a native name, should be conserved. Even the name *tridactylus* is an incorrect one, since it indicates that the pes has only three digits, whereas one of these digits is the syndactylous element, and only the first digit is absent. The size of the animal may be compared to a small rabbit. The general colour is a rather warm dark-brown, grizzled by the admixture of white tipped hairs. The fur is straight, sleek, and shining, and the coat mainly consists of under-fur. The hairs of the mid-dorsal region measure 30 mm., and are smoky-grey at the base, brown over the greater part of the shaft, and then with a white band of variable breadth succeeded by a brown tip.

Head and face without definite markings, but cheeks somewhat lighter and purer brown than the crown of the head; the region round the eye slightly darker than the cheeks and muzzle. Ears brown. Whole of dorsal surface brown, grizzled with white, slightly darker towards the hind end. The body colour becomes lighter and more rufus on the sides, and on the ventral surface it is fawn; the bases of the hairs being smoke-grey. Manus and pes clothed with short grey-brown hairs, the hair not extending over the nails. Tail a little more than half the length of the head and body, clothed with brown body fur at its base, then by short closely adpressed hairs, the hairs becoming darker and more sparse as they are traced towards the tip of the tail. In some specimens instead of the tail darkening uniformly to almost black at its tip, the darkened portion is suddenly followed by a white tip. Between the sparse hairs of the terminal portion of the tail scales become visible. The scales are placed in even rows, with an average of 14 rows to the centimetre. The ears are rather short, rounded in outline, and the outer surface is clothed with dark-brown hair. The rhinarium is naked, granulated, and black in colour; the naked portion extends some way back upon the dorsal surface of the muzzle. The nostrils are lateral and slit-like. The eyes are dark-brown. Eyelashes are black, and are short and fine; they are present upon both eyelids. Facial vibrissae well developed. The mysticial bristles are mostly dark, but the hinder members

of the series are paler, their tips being almost white. The longest vibrissa is 60 mm. The supraorbitals are dark, and measure only 20 mm. The genal set is not well marked. The manus has naked granular palms with ill-defined pads. The digital formula is $3 > 4 > 2 > 1 > 5$. The sole of the pes is entirely naked and coarsely granular. The digital formula is $4 > 5 > 2\cdot3$. The pouch is well developed, the opening being forwards; the nipples are four in number. The skull is elongated. The canines are small and thin, the last premolar, though elongated, is far smaller than that of *Bettongia*, and is marked by two or three shallow grooves.

DIMENSIONS.

	♂ Brit. Mus. Tasmania.	♂ Skin. Tasmania.
Head and body	410	320
Tail	230	180
Hind foot	81	74
Ear	35	35

DIMENSIONS OF SKULL.

	♂ Brit. Mus. Tasmania.	♀ White's Original Potoroo.
Basal length	82	66·5
Breadth	45	39
Nasals, length	45	35
Palate length	56	40

Of the former distribution of this animal is South Australia no details can now be obtained. Save the bare record of its existence in this State, which is given in the British Museum catalogue of 1888 and which has been copied into all subsequent works, I know no other reference to the creature as a South Australian animal. Its habits seem to have been but little studied, and it is high time that a good series of observations be made of the still surviving Tasmanian form. The remaining Potoroos should be carefully protected in those places where they still survive, and efforts should be made for turning them down in properly safeguarded sanctuaries. If this is not done there seems to be no doubt that the remnant of the stock will share the fate of the South Australian form and rapidly become extinct.

Sub-Family III.—MACROPODINAE.

The Sub-family contains the typical Kangaroos and Wallabies, the best known of all the marsupials, and the most distinctive specialisations of the Australian Didelphians.

All the members of the Sub-family have the following characteristics in common. The claws of the manus are not unduly elongated, and the claws of the median digits

are not disproportionately longer than those of the lateral digits. The ears are elongated and oval in outline. The canine teeth are rudimentary or absent. The upper central incisors are not disproportionately larger or longer than the other incisor teeth. Dentition I. $\frac{3-3}{1-1}$. C. $\frac{1-1 \text{ or } 0-0}{0-0}$. P.M. $\frac{2-2}{2-2}$. M. $\frac{4-4}{4-4}$. With regard to the terms kangaroo and wallaby, there is but little uniformity of usage, and the size of the adult animal is usually taken as the criterion by which any species should be classed in the one group or the other. It therefore often comes about that an animal which in one State is known as a wallaby is termed a kangaroo in a neighboring State. An attempt to delimit the use of the terms by some definite criterion meets with only partial success. If an arbitrary standard is fixed, popular usage will still render the nomenclature inexact. It is a sufficiently precise definition to lay down that an animal is termed a kangaroo only when the length of the pes of a typical adult exceeds 250 mm., all the members of the Sub-family with shorter feet being known as wallabies. On the whole such a definition fits in with the average popular usage of the terms; but a difficulty is met with in the case of the animals always known as Tree Kangaroos, which, judged by the foot length, should be rather termed Tree Wallabies.

Two divergent stocks are included within the Sub-family. The one stock is characterised by possessing high crowned (hypsodont) molar teeth and small premolars, the other by low crowned (brachydont) molars and greatly developed sectorial premolars. These two sections are readily separated. The further splitting up of the Sub-family is, however, a matter of some little difficulty, and on the whole it is true to say that no very satisfactory subdivision into Genera can be made by external characters alone. Here a table based partly on dental characters and partly on such external characters as the features of the tail will be employed.

(1.) *The Hypsodont Section*, with high-crowned molars, and the premolar teeth smaller than the molars.

(A.) With the two upper rows of incisors nearly parallel. Incisors broad, flat-topped. 1^1 smaller than 1^2. Genus 1. *Lagostrophus*.

(A^1.) With the two upper rows of incisors widely divergent backwards. Incisors narrow, sharp-edged. 1^1 larger than 1^2.

(B.) Distance between 1^3 and the premolar (diastema) less than the length of the first three molars. Genus 2. *Lagorchestes*.

(B^1.) Distance between 1^3 and the premolar (diastema) equal to or greater than the length of the first three molars.

(C.) The tail ending in a terminal tuft.

(D.) Molars $\frac{7-7}{7-7}$. Genus 3. *Peradorcus*.

(D^1.) Molars $\frac{4-4}{4-4}$. Genus 4. *Petrogale*.

(C^1.) The tail not ending in a terminal tuft.

(E.) With a cornified "nail" at the tip of the tail. Genus 5. *Onychogale*.

(E^1.) Without a cornified "nail." Genus 6. *Macropus*.

(II.) *The Brachydont Section*, with low-crowned molars and the large sectorial premolar exceeding the molars in size.

(A.) Without canine teeth. Tail very short. Genus 7. *Setonyx.*

(A¹.) With canine teeth. Tail well developed.

(B.) Pes shortened, claws curved. Arboreal.

Genus 8. *Dendrolagus.*

(B¹.) Pes elongated, claws straight. Terrestrial.

Genus 9. *Dorcopsis.*

The members of the Sub-family Macropodinae are so universally associated with Australia and all things Australian, that it might be imagined a national spirit would exert itself to preserve and cherish what is practically a national emblem. This desirable trend of public spirit has not yet come into being, and in general the fate of the kangaroos and wallabies may be summed up by saying that Australia is converting its national emblem into boot leather.

In some States the animals are afforded partial protection, but in others they are totally unprotected by legal enactments. In this State the close season is from July 1st to December 31st, and the Rock-Wallabies are totally protected, but since these animals live mainly upon the borders of States where protection is absent, and their skins are not marketed here, this total protection is only nominal. It is to be noted that the open season, when animals may be legally slaughtered, covers the period of the dependent pouch life of the young animal. It therefore happens that most females which are killed in the open season are killed with the young in the pouch.

That kangaroos and wallabies when numerous are capable of doing a considerable amount of damage to crops, and that they eat a quantity of herbage that might otherwise be grazed by sheep, is perfectly obvious ; but the rabbit has been doing all that for a great many years.

By the terms of the Animal and Birds Protection Act, 1919, any owner of land may kill, or authorise others to kill, any and all protected animals at any time if it is for the *bona fide* safeguarding of his property : provided that no carcass or skin of such animals be sold. This provision of the Act completely deprives of any sort of justification the periodic attempts to remove these animals from the partly protected list on the plea that in a certain district they happen to be doing some damage. The only effect of opening the close season or of removing it altogether is to permit the landowner to slaughter the animals for profit—he can always slaughter them for the protection of his property. If all the kangaroos and wallabies killed in Australia were killed solely for the protection of property, we should not now have to deplore the loss of several beautiful and interesting species, nor have to admit that no good first hand account can now be given of some of them by workers in Australia since no adequate series of specimens of them has been preserved.

It must also be remembered that the abundance of any species may be an extremely local affair, and must not be taken as an index of the general status of the species. Fences have so far restricted the movements of these animals that there may be a concentration of individuals at one point, although, taking Australia as a whole, the species may be a dying one. The removal of the close time because

of the local abundance of a species is therefore a step that should not be undertaken without some consideration.

Wallaby and kangaroo skins are marketed in Australia in enormous numbers. Probably about 500,000 skins pass through the markets of each of the large centres every year; and in Sydney at any rate this number is considerably exceeded. During 1919, 1920, and 1921 no less than 1,763,826 pelts were used in the fur market alone.

The bulk of the skins are converted into leather, the fur value of the adult pelts of most species not being high. Such skins as are absorbed into the fur market figure under a variety of guises, being sold as Wallaby, when in their natural condition, but after being subjected to various processes they pass as "Australian Fisher," "Koala," "Sydney Racoon," and "Skunk."

Kangaroos and wallabies are easily kept and bred in captivity; but the various Zoological Gardens in Australia must not be regarded as the places in which the future of these animals can be insured. The aim of all those interested in the preservation of the native fauna should be concentrated on the establishment of properly regulated reserves. In such reserves the animals will multiply rapidly, and experience has already shown that from a well administered reserve enough surplus stock can be produced to provide leather and furs as well as animals for Zoological Gardens and specimens for scientific study. Besides the formation of reserves much remains to be done towards the guiding of public opinion in the direction of a desire to preserve and not to exterminate; and in such aims the sympathy of the landowner should be enlisted. It would be a great thing that one day the landowners of Australia should be as proud of their kangaroo reserves as those of other lands are of their deer parks.

It is to be noted that, in the case of several wallabies and kangaroos, skull measurements of rather a large number of skulls are given here. In all these instances the skulls examined have been those of animals killed for commercial purposes. I am indebted to several generous correspondents for this material. At the camp sites of kangaroo hunters are skulls of animals skinned for the markets, and these skulls should be collected and forwarded to institutions in Australia by everyone having the opportunity. The amount of preserved material in Australian museums is altogether inadequate. In many cases this cannot now be remedied, for the animals have ceased to exist; but in many cases material which is much needed in our State collections is lying about only awaiting collection. I would here especially thank Messrs. Shields, of Melrose; Coulston, of Bimbowrie; and May, of Kangaroo Island, for rescuing skulls from the camp sites of kangaroo hunters and rendering them available for study and for preservation.

HYPSODONT SECTION.

Genus 1.—LAGOSTROPHUS (Thomas, 1886).

In this Genus there is only a single, rather variable, species known as the Banded Hare-Wallaby. Gould reported this animal as being an inhabitant of South Australia, but this was almost certainly an error. It seems most likely that the species has always been confined to Western Australia, and to some of the islands of Sharks Bay.

Genus 2.—LAGORCHESTES (Gould, 1841).

The animals belonging to this Genus are elegant little creatures appropriately enough known as Hare-Wallabies. Members of the Genus are distinguished by the common possession of the following characters. The rhinarium is wholly or partly hairy. The central claws of the pes are long and stout, and are not hidden by the hairs of the foot. The tail is rather short, not bushy or crested, but evenly short-haired throughout.

The skull has a short muzzle region. The diastema (the gap between the incisor teeth and the cheek teeth) is shorter than the length of the first three molar teeth. The incisors are small and sharp edged. The bullae are inflated.

Three variable species are included in the Genus ; one of them inhabits, or formerly inhabited South Australia ; the other two figuring as South Australian only in those accounts of the fauna in which the Northern Territory is included as part of this State. Since these northern species probably extend their range only a little to the south of the tropic, they will not be described in detail here.

(1) Hare-Wallaby.

Lagorchestes leporoides (Gould, 1840).

I know of no preserved specimens of this formerly common animal from which a description may be written of the actual form which inhabited this State. Reliance will therefore have to be placed on the details accessible in previously published accounts ; and in quoting from such accounts we must remember Gould's statement that " considerable diversity and colour is observable in different specimens, some being much redder than others, but the sexes are scarcely distinguishable by size." In general appearance the light and slenderly-built animal is very like a common Hare, the likeness being accentuated by the shortness of the head and the length of the ears. The hair is long and soft and in general colour is very like that of a Hare. The hair of the dorsal surface of the body is variegated with black, rust colour, and rusty-white, the white being most conspicuous and the rust colour but little seen save over the back of the neck and shoulders, and for a considerable space around the eye.

The sides of the body and haunches are suffused with rust colour. The ventral surface is grey-white, suffused with rust colour or yellowish, but between the hind legs the rust or yellow tinge disappears and the fur is pure white. The hairs of the dorsal surface are black at the base, banded first with reddish-brown, then rusty-white, and the tip itself is black. The hairs of the ventral surface are grey at the roots and rusty grey-white at the tips. Between the hind legs the hairs are white in the whole of their length. There is a faint and inconspicuous trace of two lateral loin bands such as are present in so many marsupials. The fore limbs have a well marked black patch on the outside of the proximal part of the forearm ; this patch is due to the absence of the longer hairs and the consequent prominence of the nearly black under-fur. The forearm itself and the manus are clothed with short brown hairs pencilled with white. On the middle of the tibia is a dusky patch. The feet are clothed with impure palish rust coloured hairs finely freckled with brown, the digits brownish. The tail is clothed throughout with short adpressed hairs, grizzled brownish-grey above, dirty white below and at the sides.

The rhinarium is completely clothed with short brown hairs, the base of the nasal septum being alone naked. The ears comparatively long and somewhat pointed at their tips; clothed internally with long white hairs, externally with short grizzled hairs.

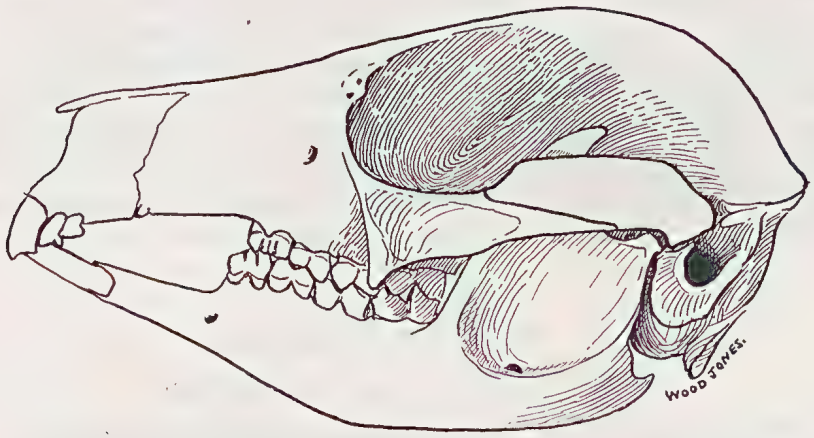

FIGURE 160.—*Lagorchestes leporoides*. Lateral aspect of the skull of a South Australian specimen. S.A. Mus., No. M. 1736. One and a half times natural size.

The skull is light and slender, with a long narrow muzzle; the bullae are much swollen, globular, smooth, and transparent. (*See* Figure 160.)

DIMENSIONS.

	Brit. Mus. ♂ Skin. N.S.W.	Brit. Mus. ♀ Stuffed. N.S.W.
Head and body	450	490
Tail	320	300
Hind foot	128	122
Ear	45	57

DIMENSIONS OF SKULL.

	Brit. Mus. ♂ N.S.W.	Brit. Mus. ♀ S. Aust.
Basal length	79	69
Breadth	48	45
Nasals, length	37	35
Palate length	50	44

In the British Museum catalogue of 1888 five specimens in the collection are recorded as being from South Australia, and Gould noted that it was "tolerably abundant in all the plains of South Australia, particularly those situated between the belts of the Murray and the mountain ranges." I have been unable to obtain any evidence of its present existence in the State, and in all probability it is completely exterminated. Of its habits Gould records that it is "usually solitary,

and sitting close in a well formed seat " like a hare. Both Gould and Krefft have recorded its wonderful jumping powers, Krefft having observed it jump more than 8ft. high. Gould's account is graphic and is worth quoting entire. " For a short distance its fleetness is beyond that of all others of its group that I have had an opportunity of coursing. Its powers of leaping are also extraordinary. While out on the plains of South Australia I started a Hare Kangaroo before two fleet dogs. After running to a distance of a quarter of a mile it suddenly doubled and came back to me, the dogs following close to its heels. I stood perfectly still, and the animal had arrived within 20ft. before it observed me, when, to my astonishment, instead of branching off to the right or to the left, it bounded clear over my head and, on descending to the ground, I was able to make a successful shot, by which it was procured."

(2) Leichhardt's Hare-Wallaby.

LAGORCHESTES LEICHARDTI (Gould, 1863).

This species is larger and far more brilliantly coloured than *L. leporoides*. There is a bright rufous patch around the eye. The dorsal surface of the body is rufous, the ventral surface nearly pure white. The ears are shorter than those of *L. leporoides*. The animal was taken by the members of the Horn Expedition in the McDonnell Ranges, where it appeared to be by no means uncommon. It cannot, however, be accepted as a member of the fauna of South Australia, as this State is now delimited. It may be noted that Leichhardt's name was incorrectly transcribed when used for this species.

GENUS 3.—PERADORCUS (Thomas, 1904).

This Genus was constituted by Oldfield Thomas for the reception of the aberrant Wallaby known as the Little Rock-Wallaby, (*Peradorcus concinna* Gould, 1842). The animal has been found only in the far North-West of the continent.

GENUS 4.—PETROGALE (Gray, 1837).

This Genus contains the beautiful Rock Wallabies, characterised, for the most part, by adaptations to their environment of the open rock-strewn ranges.

These adaptations naturally concern the method of progression and therefore affect the pes and the tail most markedly. The tail being used far more as a balancing organ than as a fulcrum employed in slow progression, is well clothed with longish outstanding hair, and tufted at its extremity. It is not thickened at its base as is the tail of the kangaroos and scrub wallabies, but is cylindrical and devoid of the thickened pad present in the tails of other forms. In harmony with this fact the skin can be stripped from the underlying tendons and bones as can be done in the case of an ordinary rat, whereas in the kangaroos and scrub wallabies the skin is adherent to the thickened tail pad.

The pes is padded and strongly sculptured with granulations on the sole. The nails are short, and a fringe of stiff hairs outlines the margins of the sole and of the

digits. (*See* Figure 163.) Another modification which at first sight seems to have a less direct association with environment is the naked rhinarium. (*See* Figure 161.) But it is instructive to note that the same modification is present in the Euro (*Macropus robustus*) which shares the habitat of the rocky ranges with the Rock Wallabies.

Of the Rock Wallabies there are nine well defined species, and three of these inhabit South Australia and its islands, one of the continental species being practically confined to this State, and the insular form occurring only on a single island in the Bight.

FIGURE 161.—Rhinarium of *Petrogale xanthopus*.

KEY TO THE SOUTH AUSTRALIAN SPECIES.

External characters—

(A.) Tail annulated with alternate rings of brown and pale yellow. Backs of ears uniform yellow. (1) *P. xanthopus.*

(A¹.) Tail not ringed. Ears not uniformly coloured behind.

(B.) Ears with small white patch at base. Lateral body stripes brown. (2) *P. lateralis.*

(B¹.) Ears with large white patch at base. Lateral body stripes almost black (3) *P. pearsoni.*

Cranial characters—

(A.) Skull large. Basal length more than 95 mm. (1) *P. xanthopus.*

(A¹.) Skull small. Basal length less than 95 mm.

(B.) Bullae but little inflated. (2) *P. lateralis.*

(B¹.) Bullae considerably inflated. (3) *P. pearsoni.*

Of these three species *P. xanthopus* inhabits the rocky country from the Gawler Ranges to the Flinders Ranges, and to the eastern boundary of the State at Bimbowrie and Cockburn. *P. lateralis* lives in the ranges of the far Centre, and was found by the Horn Expedition at Alice Springs and in the McDonnell Ranges, and by the Elder Expedition in the Barrow Ranges. It probably extends further to the south and west and so into South Australia proper. *P. pearsoni* is confined to Pearson Island, in the Bight.

(1) Yellow-footed Rock-Wallaby.

PETROGALE XANTHOPUS (Gray, 1854).

This is a large, handsome species, distinguished at once from all the other members of its group by the ring markings on its tail and by the uniform yellow backs of its ears. The fur is long (15-20 mm.), soft, and silky. General colour of the dorsal surface fawn grey, ventral surface white. Face and crown of the head fawn grey

becoming more brown around the eye, and behind and above the eye being replaced by a bright, almost orange, yellow patch. Starting on the muzzle and running below the eye to the ear is a well defined white cheek stripe, below which the side of the jaws becomes fawn grey again ; on the crown of the head behind the ears is a dark-brown patch which continues backwards as the mid-dorsal stripe. Ears long and clothed on their outer surfaces with uniform yellow hairs. Inner surfaces naked towards the middle of the concha ; fringed with yellowish-white hairs along the margins and at the tip.

Whole of the dorsal surface of the body fawn grey, with a median dorsal stripe of dark-brown starting between the ears upon the crown of the head and fading out tailwards so that it can only be certainly traced as a stripe to about the middle of the back. At the back of the fore limb, where it joins the body, is a dark-brown patch behind which is a white stripe, which starts upon the back of the shoulder and extends downwards towards the hip.

A similar brown patch is present in front of the hind limb where it joins the body, which again is followed by another white area. Whole of the skin, chest, and ventral surface of the body white. Fore and hind limbs uniformly yellow : dorsum of manus and pes brown. The tail abundantly haired with alternate rings of yellow and brown, about a dozen rings of each colour being usually recognisable. Terminal tuft of tail tawny yellow-brown.

Naked parts of ear dark coloured and punctate. The rhinarium is naked, the skin black in colour and tessellated in texture. The eye is dark-brown, the long black eyelashes much better developed upon the upper lid than the lower. All sets of facial vibrissae are represented, but none is very well developed, and few members of any set exceed 30 mm. in length.

The skull is larger than that of any other Rock-Wallaby, and is distinguished for its straight, elongated muzzle and its peculiarly straight lower jaw. (*See* Figure 162.)

DIMENSIONS.

	♂ S.A. Fresh.	Brit. Mus. ♀ Stuffed.	Brit. Mus. ♂ Flinders Range. Skin.
Head and body	650	680	800
Tail	650	600	600
Hind foot	170	160	170
Ear	85	70	75

DIMENSIONS OF SKULL (average of 25 South Australian skulls of both sexes).

Basal length	102
Breadth	59
Nasals, length	49
Palate length	62
Diastema	24

The Yellow-footed Rock-Wallaby is still fairly abundant in certain parts of South Australia, but from many of its old haunts it has completely disappeared. It would

seem that at the present time it is being driven mainly to the north and east of the State, and that its last stronghold in South Australia will be upon the New South Wales border. If it has not altogether disappeared from the Gawler Ranges it must now be a very rare animal, and in many parts of the Flinders Ranges its numbers are considerably reduced. From the eastern portion of the State it will almost certainly disappear before very many years are past, since its pelt is far too attractive to permit it to survive as long as the fur trade exists. Although a totally

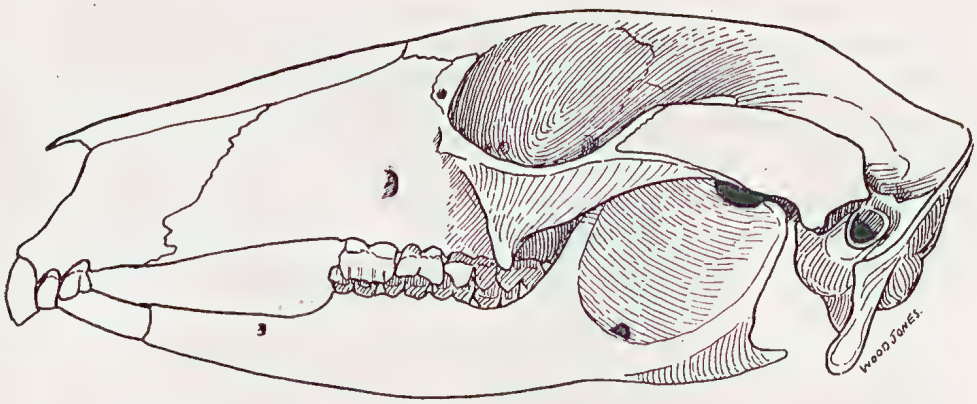

FIGURE 162.—*Petrogale xanthopus*. Lateral view of skull. Natural size.

protected animal in this State, this protection is not extended to it by certain of the States upon the borders of which it lives. It is therefore not to be wondered at that pelts of the animal are disposed of in the markets of States other than South Australia, even though the animal was obtained within the geographical boundaries of our own State.

Petrogale xanthopus is a fitting example of an animal which needs sanctuary for its preservation and more stringent legislative efforts to check its slaughter.

(2) **Black-flanked Rock-Wallaby.**

PETROGALE LATERALIS (Gould, 1842).

This distinctly marked animal is, as a rule, named "West Australian Rock-Wallaby" in works dealing with the marsupials; but since it is by no means confined to Western Australia, the name is an inappropriate one, and is here discarded in favour of the older name used above.

A considerably smaller animal than *P. xanthopus*, lightly built, and slender. The fur is rather long and soft, and is somewhat woolly in texture. General colour light brownish-grey. The head and face, the neck, shoulders, and front of fore limbs with less brown and more grey than the rest of the body. The face is grey, with a well defined dark stripe running through the eye nearly to the ear. The dark stripe being succeeded below by a whitish or yellowish stripe. Crown of

the head dark-grey, the tips of the hairs black ; the occiput is nearly black, and a line of the same dark-brown or black colour runs down the back of the neck and is distinguishable to about the middle of the back. The lower portion of the back has a more pronounced brown tinge than the upper portion of the back and shoulders. The chin, chest, and mid line of abdomen pale buff-yellow to brownish-white.

The most conspicuous marking is the lateral stripe which starts as a dark-brown patch on the elbow and runs as a dark-brown line along the side of the abdomen to the flank and along the thigh to the front of the knee. There is an almost white line just above this brown one, so that the dark stripe is outlined upon each side with greyish-white, the white of the ventral surface on the one hand and the white stripe, intervening between it and the grey of the back, on the other.

Limbs grey, with the manus and pes dusky-brown. Rhinarium naked and black. Ears rather short, clothed with dark-brown hairs on the outer surface save at the extreme tip and at a patch over the base, where the hairs are brownish or yellowish white; internally the hairs are dirty yellowish white. Tail clothed with grey hairs in its basal half, the apical half is bushy and the hairs are dark-brown or black.

DIMENSIONS.

	♂ W.A. Brit. Mus.	♀ W.A. Brit. Mus.
Head and body	590	600
Tail	460	420
Hind foot	139	120
Ear	48	49

DIMENSIONS OF SKULL.

	♂ Brit. Mus	Brit. Mus.
Basal length	84	79
Breadth	48	48
Nasals, length	39	37
Palate length	51	49
Diastema	22	18·5

The members of the Horn Expedition found this Rock-Wallaby plentiful in, and confined to, the rocky ranges of the Centre. It appears to occupy all the hill country comprised in the area drained by the Finke and Todd Rivers. Specimens were obtained in the McDonnell Ranges, in the Barrow Ranges, and at Alice Springs. How far its range extends to the south and into South Australia I have failed to ascertain, and at present no evidence is available as to its actual presence in the State. A Rock Wallaby was abundant not very long ago in hilly country to the west of Lake Torrens, and from first hand accounts of this animal it seems most likely that it was this species. Further research in this interesting region can alone determine the point.

(3) Pearson Island Rock-Wallaby.

PETROGALE PEARSONI (Thomas, 1922).

This beautiful wallaby was only recognised as a distinct species and named and described in 1922. It is an outlying insular member of the group to which *P. lateralis* and *P. hacketti*, of Mondrain Island, belong.

The description of the type specimen is as follows:—"Size comparatively small, about as in *lateralis*, decidedly smaller than in *hacketti*. General colour, on the whole, much as in *lateralis*, paler than in *hacketti*. Dark lateral lines of the underside, however, more blackish, those of *lateralis* being dark-brown. White patches at the base of the ears larger and more prominent. Tail with its upper and under surfaces, from about 3in. from the base, contrasted black, the sides dull buffy whitish; above, the black soon fades off into the brownish terminal tuft, but below it continues to within 2in. of the tip. This tail colouration is, on the whole, more as in *hacketti* than *lateralis*, but in both there is a considerable variation.

The usual narrow black dorsal line is continued rather more definitely on to the rump than in any of our specimens of *lateralis*, but the difference may be due to this part being in fresh pelage, and so showing the line more distinctly.

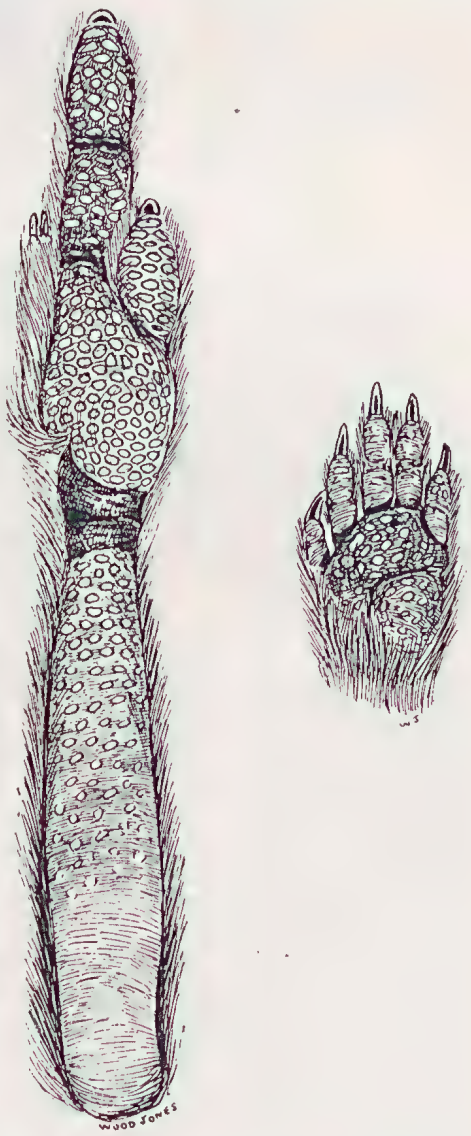

FIGURE 163.—*Petrogale pearsoni*. Left pes and manus. Natural size.

Skull (*see* Figure 164) in size and general shape quite as in *lateralis*, smaller and with less heavy supraorbital ridges than in *hacketti*. In the bullae there is a difference between *lateralis* and *hacketti* which had not been previously noticed. In the former they are fairly well swollen, anteriorly as well as posteriorly, so as to produce a transverse convexity (hardly to be called a ridge) in front of which the bone descends nearly vertically towards the level of the glenoid surfaces. In *hacketti*, however, the whole bulla is larger, but lower and more spread out, its front part evenly and gradually descending towards the glenoid level without marked transverse convexity. In *pearsoni* the bullae are most like those of *hacketti*, although perhaps a little more swollen. In making this comparison six

skulls of *hacketti* and ten of *lateralis* have been available, so that the difference is evidently fairly constant. Incisors a little larger than in *lateralis*, the whole row 10 mm. in length, about as in *hacketti*, as compared with about 9 mm. in *lateralis*. Secator also slightly larger than in *lateralis*, much smaller than in *hacketti*.

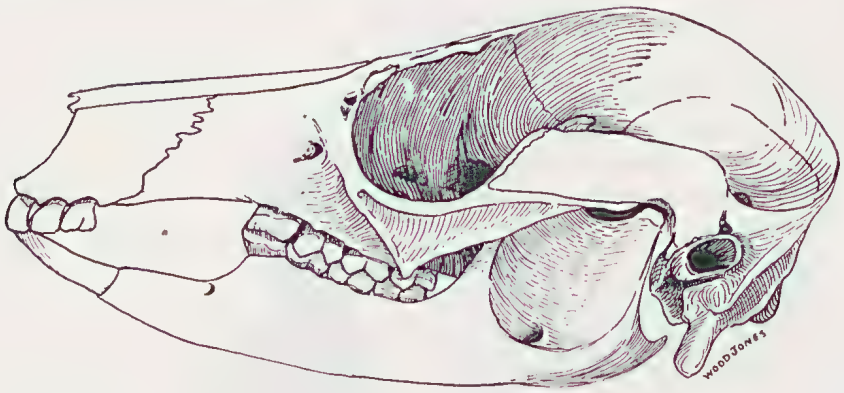

FIGURE 164.—*Petrogale pearsoni*. Lateral view of the skull of an adult male. Natural size.

Dimensions of the type (measured on the remade skin).—Head and body, 500 mm.; tail, imperfect; hind foot, 136; ear, 43. Skull—Greatest length, 94; condylo-basal length, 90; zygomatic breadth, 48; nasals 39 x 14; palatal foramina, 7·7. Length of I^3 4·5, of P^4 6·9. Combined length of M^{1-3} (unworn) 19."

The following table gives the DIMENSIONS of eleven typical skulls :—

	A	B	C	D	E	F	G	H	I	J	K
Greatest length	88	88	91	103	91	94	100	97	99	98	98
Condylo-basal length	85	81	85	95	85	89	94	89	91	92	93
Zygomatic breadth	47	46	46	52	47	47	51	47	51	—	—
Nasals, length	36	35·5	37	44	36	38	45	39	42	42	—
Nasals, breadth	13	12	13	15	13	13	14	13	14	15	—
Palatal foramen	7	7	7	8	7	8	7	8	8	8	7
Length of I^3	4·5	—	4·5	4·5	5	4·5	4	4	4·5	—	—
Length of P^4	5	5	6	6·5	5	5	7	7	6	6·5	6
Length, M^{1-3}	17	17	17	19	17	16	18	18	17	16	17

The length of the tail in an average specimen is 500 mm. In the skull there is very commonly developed (four times in 12 specimens) an os bregmaticum (the so-called os epilepticum of human anatomy) and even when it is absent a sutural irregularity at the bregma is usually present. (*See* Figure 165.) In a series of skulls of *Petrogale xanthopus* from Bimbowrie the same remarkable little bone occurs with about the same frequency, but so far I have not noticed it in any of the Wallabies of other Genera.

The skull is remarkable for its very light ossification, the bones of the cranial vault being extremely thin, and compared with the skulls of such Wallabies as *Thylogale* (*Macropus*) *eugenii* it can only be described as fragile. The teeth are commonly in very bad condition, and in several specimens are enveloped in masses of tartar; alveolar abscesses also occur in connection with the roots of the teeth in two skulls obtained. Like the insular bandicoots and rats, the wallabies are

usually extremely fat. The fur swarms with a *Mallophaga* which readily parts company with a dead wallaby in favour of a living human host, and the intestines of all specimens obtained contain a very heavy infection of nematode worms.

That a rock wallaby lived upon the northern portion of the northern island mass of the Pearson's group has been for years common knowledge to the men employed in the coastwise traffic of the Bight. From its diurnal habits, from its comparatively large numbers in a very limited area, and from its habit of frequenting the tops of the huge granite boulders which constitute the shoreline of the island, it is a conspicuous creature readily seen from the deck of a ship passing under shelter of the eastern side of the group.

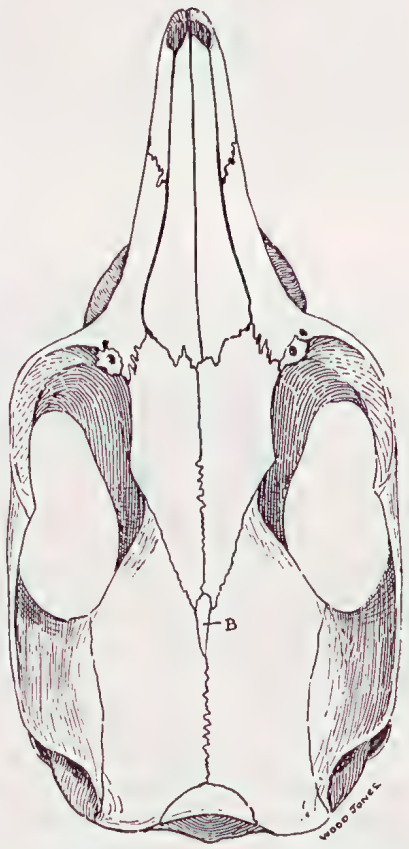

FIGURE 165.—*Petrogale pearsoni*. Dorsal view of the skull of an adult male. Natural size. (A small extra bone, the os bregmaticum, is marked B).

It is an exceedingly beautiful wallaby, its markings conspicuous in their contrasts of dark lateral body stripes, white throat and chest, and bushy tufted tail. On such level ground as the island affords its gait appears somewhat awkward, for it travels with the head low and the tail arched conspicuously upwards. It seems that for such progression it has to cant its body forwards at an ungraceful angle, for the tail is not used as a fulcrum as it is in the "scrub" wallabies and kangaroos, it is carried sheer off the ground in all gaits. When one is started across the more or less level saltbush areas it gets away at an awkward gait, using every bush for cover as it goes, but seeming to proceed more or less without regard to its bearings. When it wishes to see where its safest line of retreat lies, or where it is threatened, it stops, puts up its head, and looks around. But short of stopping it appears unable to raise its head from its rather ungraceful stoop to take in any wide view. Though it may seem an ungraceful animal in open bush country, it is a very different creature when seen upon the huge, fantastic, granite boulders which constitute the main portion of its island home. Here its movements are astonishing; there seems to be no leap it will not take, no chink between boulders into which it will not hurl itself. There is no part of the northern portion of the islands that it does not inhabit; it is at home on the naked granite boulders of the shore upon which the surf crashes, and on the lichen covered boulders of the summit, nearly 800ft. above, where moss, ferns, and casurinas of large growth constitute a very distinct type of environment. It does not exist upon the southern portion of the main northern island, and almost certainly it is absent from the southern detached portions of the group. Its area even on the Pearson Group is therefore a peculiarly restricted

one, and it is rather remarkable that it should be confined to only one of the three partially connected masses which constitute the complex northern main island.

The wallaby has no obvious natural enemy; the sea eagles, crows, and sea lions may possibly take occasional toll of young or sick, but from its habit of sitting exposed on a rock at any time of the day it would appear that there was but little threat to its safety in the normal condition of its environment. In November some females were seen with large young still in the pouch; in January and February the young were all running with the parents.

Petrogale pearsoni is one of the many zoological treasures left stranded on the islands of the Bight; it is to be hoped that it will long remain in possession of its restricted home. Pearson Island has been proclaimed as a sanctuary, and so far as legal enactments can ensure it the animal should be safe from the threat of extermination at the hands of man.

Genus 5.—ONYCHOGALE (Gray, 1841).

This Genus contains the three species of beautiful Silky or Nail-tailed Wallabies. These three species form a natural little group which derives its popular and scientific name from the fact that the tail ends in a curious horny excrescence, or nail. Although this character is usually said to be "altogether unique among marsupials, and is only found among other mammals in the Lion," we have already noted (p. 153) that in the Bilbys of the Genus *Thalacomys* a very similar cornified spur is present.

What the functions of this spur may be it is impossible to guess. As Oldfield Thomas observed in 1888, "Observations on the living animal are much needed with regard to this interesting point." I am unaware of any observations recorded since that date, and by now the chance of making observations upon living animals has passed for the South Australian naturalist.

In addition to the possession of this curious nail, members of the Genus are distinguished by their small, narrow, incisor teeth which, unlike those of the rest of the wallabies, decrease evenly in size from before backwards; the third incisor being a very slender tooth which points markedly forwards. The rhinarium is hairy, the bottom of the septum of the nose being the only naked area. The central claws of the pes are long, narrow, and compressed, and very sharp. The tail is long, tapering, short haired, not bushy, but more or less crested towards its tip.

Of the three species contained in the Genus, one (*Onychogale unguifera*) is confined to the north and west of Australia, another (*Onychogale frenata*) is confined to the eastern portion of the continent, and the third (*Onychogale lunata*) at one time ranged from the Swan River district of Western Australia eastwards into this State.

Crescent-marked Wallaby.

Onychogale lunata (Gould, 1840).

The animal is of small size, in general being comparable to a rabbit, and its form is very light and delicate. The general colour is clear ashy-grey, with a distinct crescent shaped white mark on the fore quarters which gives its popular and scientific names. The fur is soft and fine, the under-fur long, slaty-grey at the base, pale-

grey terminally. The face is grey, there is a slightly paler cheek stripe, and the area round the eye is paler and more rufous. The back and sides of the neck uniform rich rufous or "vinous rust colour," the bright colour being due to the rufous tips of the under-fur. The white shoulder stripe is very well marked; it runs from the white fur of the ventral surface of the body around the shoulder and ends abruptly on the scapular region without encroaching on the neck. The fur on the ventral surface is pale-grey at the base and white at the tips. The sides of the body are paler than the back, and have an admixture of rufous hairs. There is an ill-defined paler hip stripe. The fore and hind limbs pale-grey, manus and pes pale-brown. Tail only moderately long, clothed throughout the greater part of its length with short, closely adpressed grey hairs. The terminal portion of the tail with longer and darker hairs forming a slight crest. The horny nail at the

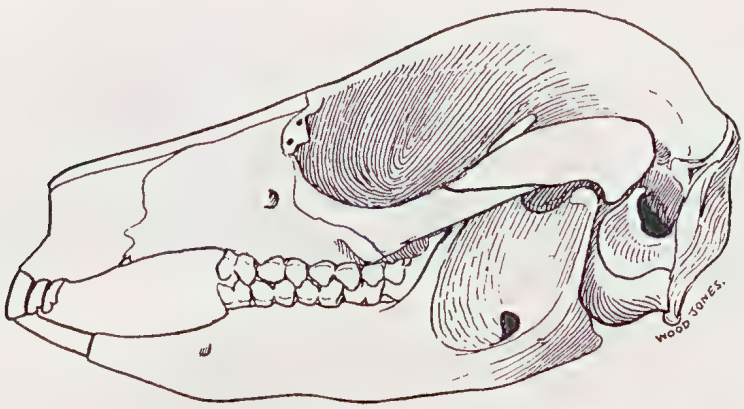

FIGURE 166.—*Onychogale lunata*. Lateral aspect of the skull of a South Australian specimen. S.A. Mus., No. M. 1731. One and a half times natural size.

extremity of the tail is rounded and some 3 mm. in diameter. The ears are of medium length and tapering towards their tips; they are clothed with long white hairs within, with fine black hairs at the apex, and with short brown hairs over their backs.

The skull is small and lightly built. The muzzle is slender and pointed. (*See* Figure 166.) The bullae are large, much swollen, and transparent. The teeth are small, the incisors in particular being very slender. The canine is usually present, but minute and functionless.

DIMENSIONS.

	Stuffed. ♂ Brit. Mus. S. Aust.
Head and body	500
Tail	332
Hind foot	120
Ear	58

DIMENSIONS OF SKULL.

	Brit. Mus. ♂ West. Aust.	Brit. Mus. ♀	S.A. Mus., No. M. 1731.
Basal length	64	61	c 60
Breadth	39	39	36
Nasals, length	28	25	22
Palate length	38	38	—

In 1884 Mr. E. B. Sanger reported the Crescent-marked Wallaby from the Centre and in the British Museum catalogue of 1888 three South Australian specimens, collected by Sir George Grey, are recorded.

The Elder Expedition in 1891 met with it in the Everard Ranges, and the skull of one of the specimens procured at that time is illustrated in Figure 166. The Horn Expedition of 1894 obtained two specimens at Alice Springs. I know of no more recent observations, and probably so far as South Australia is concerned the animal has ceased to exist. In Western Australia it is now greatly reduced in numbers and confined to a very restricted area from which it seems to be rapidly disappearing. I know of no attempt to preserve this Western Australian remnant by placing some of the animals in a faunal sanctuary.

Genus 6.—MACROPUS (Shaw, 1790).

This Genus contains what may be termed the typical wallabies and kangaroos. The members are distinguished by possessing the following characters in common. The third upper incisor has an elongated cutting edge, it being usually the broadest tooth of the incisor series. The canines are in an extremely reduced condition and are lost very early. The bullae are not inflated. The tail is thick, and used as a fulcrum in slow progression; it is tapering towards the tip, evenly haired, and not terminated by a brush. The ears are elongated. Considerable attention is sometimes given to the direction of the hair upon the neck and body. This study of the hair trend forms an important subject in itself, but it is one of philosophic rather than of taxonomic importance, for it may be said that once the skin of an adult animal has passed through the hands of a taxidermist no deduction can safely be made concerning the hair trends of a well furred animal like a Kangaroo. The Genus is a very large one, and contains animals of rather varying characters and very varying size. As Oldfield Thomas has pointed out, the members of the Genus range in size "from that of a rabbit to that of a man." It is, therefore, convenient to divide this large assemblage of forms into rather smaller groups, and this classification has already been carried out in rather variable popular usage. Although the terms are not used throughout Australia with precisely the same connotation, we may accept Pademelons or Scrub wallabies, Brush wallabies, and Kangaroos as constituting three somewhat losely defined groups. These three groups correspond to the Small wallabies, Large wallabies, and Kangaroos as defined by Oldfield Thomas, or, better still, to the Sub-genera *Thylogale*, *Wallabia*, and *Macropus*.

We will, therefore, follow both popular and scientific usage and split the large Genus *Macropus* into three Sub-genera as follows :—

(A.) Size small. Pes less than 150 mm. in length. Basal length of skull less than 108 mm. Palatine vacuities large. Popularly known as Pademelons or Scrub Wallabies. Sub-genus 1. *Thylogale.*

(B.) Size medium. Pes from 160-250 mm. in length. Basal length of skull from 108-130 mm. Palatine vacuities medium. Popularly known as Brush Wallabies. Sub-genus 2. *Wallabia.*

(C.) Size large. Pes more than 260 mm. in length. Basal length of skull more than 135 mm. Palatine vacuities small. Popularly known as Kangaroos. Sub-genus 3. *Macropus* (*sens. strict.*).

Sub-Genus 1.—Thylogale (Gray, 1837).

Unfortunately the time has gone by when a good first-hand account of the small scrub wallabies inhabiting South Australia could have been written. The disappearance of the mainland wallabies is almost as remarkable a phenomenon as the disappearance of the Native Cat. So much has disappeared and so little has been preserved that it is now quite impossible to write dogmatically of the species which inhabited this State only a comparatively few years ago.

At the present time there is only precise evidence of the existence of a protean species which had a wide distribution upon the mainland and upon some of the islands lying off the coast ; a second species, closely allied, confined to one island in the Bight ; and a third which inhabited the South-East. It is likely that had more careful collecting been carried out and a sufficiency of material been preserved while there was yet time, evidence would have been acquired to show that in reality our small wallaby fauna was richer in species than we must now assume it to have been. The dominant species of scrub wallaby which at present is an inhabitant of South Australia has had many scientific names attached to it, and even now it cannot be affirmed with great conviction that the scientific name by which it is commonly known is the original and correct one for the species. Here we will orthodoxly term it *T. eugenii.*

Scrub Wallaby, Dama Wallaby or Pademelon.

Thylogale eugenii (Desmarest, 1817).

For want of mainland specimens the description here given applies to the form now living on Kangaroo Island.

Size fairly large. Form robust and sturdy. Coat thick and long, under-fur abundant and soft. General colour a dark, grizzled, grey-brown, becoming rufous upon the sides of the body and on the limbs. Face grizzled grey, slightly lighter on the cheeks than on the forehead, muzzle or margins of the upper jaw. Crown of the head slightly darker. Occiput with a darkening which extends between the ears backwards as a variably defined mid dorsal stripe. Hairs of the mid line of

the dorsal region 25 mm. in length, dark smoky-grey at the base, then with a narrow buff area, followed by a black or dark-brown tip. Interspersed with the under-fur of the back are long piles, 45 mm. in length, and dark-brown or black in their whole extent. On the sides of the body the long piles become banded with buff, thereby producing the paler colouration of the flanks. Here also the black tips of the short hairs become replaced by rufous.

FIGURE 167.—Rhinarium of *Thylogale eugenii*.

Chin, throat, and ventral surface pale-buff with a slight and varying admixture of rufous, the hairs being smoke-grey at the base and buff at the tips. Inner aspect of the fore limbs pale rufous, outer aspect rather rich rufous. In younger specimens the rufous colouration extends dorsally over the scapular region and ventrally on to the chest. Manus clothed with short, grizzled, brown hairs. Hind limb buff, with admixture of rufous on its outer aspect. In some living specimens in certain lights a fairly distinct paler loin stripe is plainly marked. This loin stripe is, as a rule, not apparent on the prepared skin.

Pes clothed with short grizzled buff-brown hairs. Tail uniformly clothed on its dorsal surface with grizzled buff hairs, the dark tips of which become more conspicuous in the mid line towards extremity; on the ventral surface the hairs lack the black tip.

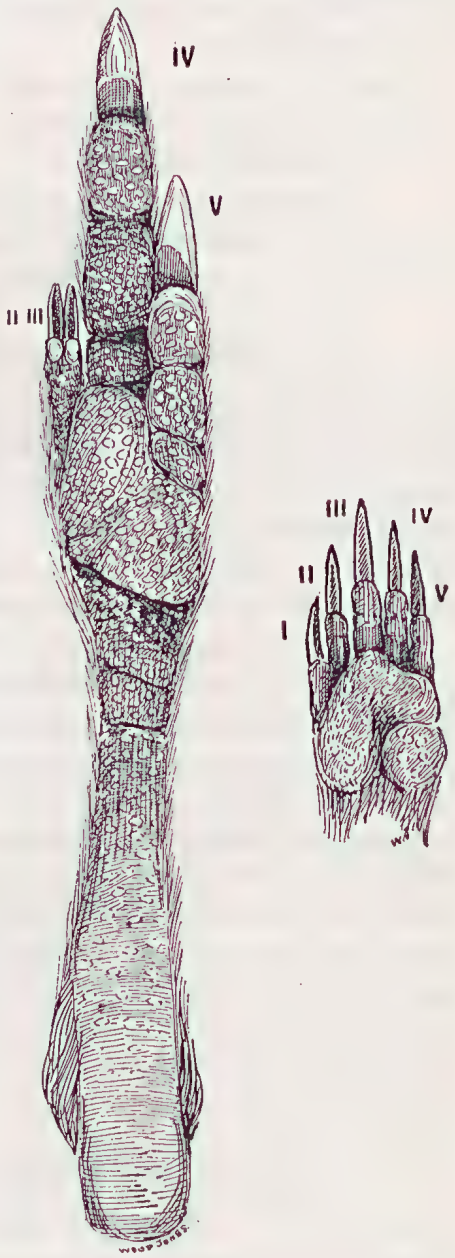

FIGURE 168.—*Thylogale eugenii*. Left manus and pes. Natural size.

Ears fairly long and pointed, somewhat darker than the head and face, clothed with grizzled brown hairs on the outer surface, and uniform buff hairs on the inner surface. Rhinarium naked over the area depicted in Figure 167.

The pupil is circular, the iris dark brown; abundant long black eyelashes spring from the upper eyelid; the lower lid giving origin to only a few, far shorter, hairs.

Facial vibrissae entirely black. Mysticials 30 mm., supraorbitals 35 mm., and genals 40 mm. in length. Submentals and interramals buff and inconspicuous. Manus and pes as in Figure 168.

The sexes differ but little. The males are distinguished by having more pointed heads and being generally paler in colour than females. They also exceed the females in size.

The skull is rather massively built and solid. It is readily distinguished from that of any other South Australian wallaby by the expanded posterior ends of the nasal bones, the outer margins of which are gently curved, and the square, parallel-sided interorbital portion of the skull. (*See* Figures 169 and 170.)

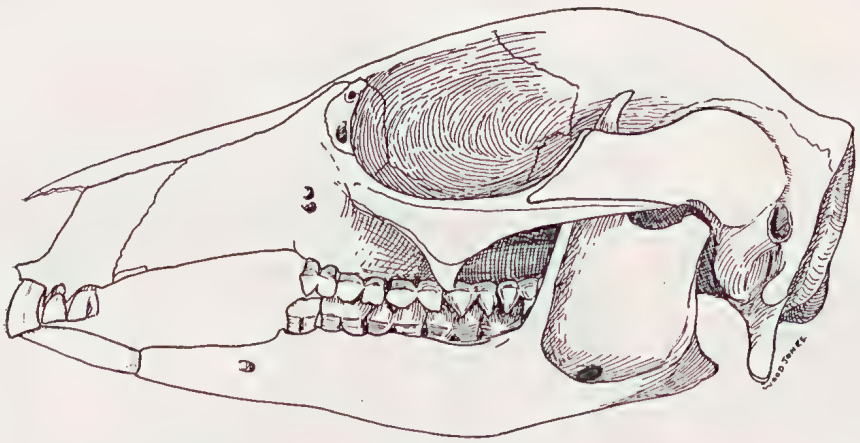

FIGURE 169.—*Thylogale eugenii*. Lateral aspect of skull of an adult male from Kangaroo Island. Natural size.

This description of the Kangaroo Island form differs from the classical descriptions and from mounted specimens of the mainland animal in the South Australian Museum in one or two rather noteworthy features. The typical mainland form is described as having the face uniform grey with, usually, an indistinct white cheek stripe. The manus and pes of the mainland form are said to be nearly black at their extremities. Neither of these features is marked in the insular form. Possibly the Kangaroo Island Wallaby deserves specific or sub-specific rank, but owing to the uncertainties of the nomenclature of the Dama Wallaby group the matter is one of unusual complexity.

DIMENSIONS of average full-grown Kangaroo Island males.

Head and body	*c* 710
Tail	" 510
Hind foot	" 140
Ear	" 60
Weight from 24lb. to 26lb.	

This is considerably larger than the mainland form or the animal originally obtained on St. Peter Island and named *eugenii* by Desmarest.

DIMENSIONS OF SKULL.

	Average of Fifty Male Skulls from Kangaroo Island.	Average of Forty Female Skulls from Kangaroo Island.
Basal length	98·8	94·8
Breadth	54·5	52·8
Nasals, length	38·7	36·4
Nasals, breadth	19·2	18·9
Palate length	59·8	57·3
Interorbital constriction	17·1	17·1
Diastema	22·2	20·7
M^1—M^3	19	19

Of the mainland form the only skulls available for measurement are the following in the South Australian Museum :—

	No. 1748, Pt. Lincoln.	No. 1755, Tickera.	No. 1740, Pt. Lincoln.	♂ No. 1746, Pt. Lincoln.
Basal length	92	88	84	82
Breadth	50	50	48	50
Nasals, length	35	35	35	30
Nasals, breadth	18	16	16	16
Palate length	57	51	55	55
Interorbital constriction	16	16	14·5	17·5
Diastema	23	17	20	22
M^1—M^3	17	17	17	15

It is extremely difficult to define the former range of this complex species on the mainland of South Australia, or even to discriminate with any certainty between the mainland form and the type of animal now living on Kangaroo Island. Only a few years ago it swarmed in scrub-covered districts all over the State, to-day it seems impossible to secure a single mainland specimen for scientific study. In places where annual battues were held by the present landowners less than twenty years ago it has disappeared altogether. It is almost certain that some still linger upon the mainland, notably at the southern end of Eyre's Peninsula and in the South-eastern districts, but so far these animals have not been properly studied or preserved. The naturalist in South Australia is dependent upon Kangaroo Island for his material. In the island it breeds only once a year, and normally only one young is produced, it being an extremely rare phenomenon for two young to be found in the pouch.

In Kangaroo Island it is abundant and, since it lives in thousands upon Flinders Chase fauna reserve, it is guaranteed, in so far as complete protection can guarantee it, perpetual survival.

This animal has an interesting, and a somewhat involved, history. It was named *eugenii* because Péron and Lesueur captured what was presumably the type specimen upon L'ile Eugene, which was the name the French navigators gave to St. Peter Island in Nuyts' Archipelago. We must not lose sight of the fact that the original

animals came from St. Peter Island, and not from the mainland. Of the wallaby which lived on this island Flinders says that " at 2 o'clock Mr. Brown and his party returned from the eastern island bringing four kangaroos of a different species to any yet seen. Their size was not superior to that of a hare, and they were miserably thin and infected with insects."

Péron and Lesueur give us the following account :—" Le kanguroo existe en grand nombre sur L'ile Eugene, ou l'on peut en faire un chasse productive ; nous ne l'avons point vu sur le continent. Ce quadrupede parvient au poids de huit a dix livres (quatre a cinq kilogrammes) : sa fourure est epaisse son poil tres fin et d'une belle couleur rousse tirant sur le brun."

There is no need to discuss the confusion that has arisen out of the dual nomenclature of the island of origin of the species, nor is there need to dwell upon the many confusions that have arisen out of the designation " West Coast." To the South Australian, " West Coast " means the west coast of Eyre's Peninsula, to most zoological authors it has meant the west coast of Australia. These things are sources of very great confusion, and they are patent to any student who cares to look into the literature.

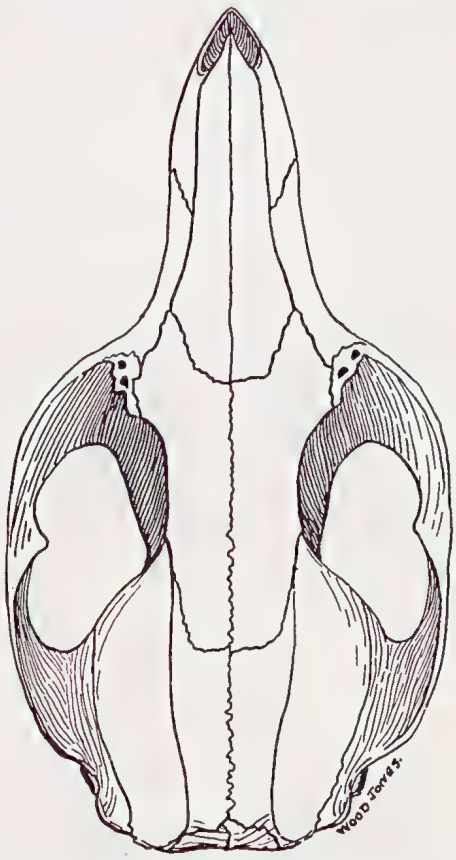

FIGURE 170.—*Thylogale eugenii*. Dorsal aspect of skull of an adult male from Kangaroo Island. Natural size.

The wallaby of St. Peter Island has become extinct, and therefore we cannot compare the animal now known as *Thylogale eugenii* with the St. Peter Island animal, and, moreover, the original specimen described by Desmarest is no longer in existence in Paris. It would seem to be somewhat doubtful if the animal now known as *Thylogale eugenii* is the same as the animal originally seen and captured on L'ile Eugene. The Kangaroo Island Wallaby is readily kept and bred in confinement, but it always evinces a shy and nervous disposition. When at rest it commonly sits with its tail thrust forwards between its hind legs. It has the habit—common among wallabies—of licking the arms when oppressed by the heat. In its wild state it moves about in a very silent manner when setting out upon its evening walk in search of food. It uses regular runs, which present the appearance of well-beaten highways leading through dense bush to the open glades in which it feeds. But although it threads its way through these runs in silence, the least cause of alarm will make a wallaby " thump," a sound produced by the striking of the earth with its hind feet. This thump is a warning note, and is produced by most gregarious wallabies and kangaroos.

(2) Flinders Island Wallaby.

THYLOGALE FLINDERSI (Wood Jones, 1924).

It seems evident that a mainland form of what we may term the Dama Wallaby group was widely spread over the southern portion of Australia. This mainland form, with its offshoots in widely separated localities, is represented by *T. dama* (Gould, 1844), and *T. gracilis* (Gould, 1844) in the west; by *T. derbianus* (Gray, 1837) in the south and west; by *T. thetidis* (Lesson, 1827) in the south and east; and by *T. parma* (Waterhouse, 1846) in the eastern portion of the continent.

As recognised insular offshoots from this stock are *T. houtmanni* (Gould, 1844), from the Abrolhos in the west; the lost *T. eugenii* (Desmarest, 1817), from St. Peter Island in the Great Australian Bight; and the Kangaroo Island form here referred to orthodoxly, but almost certainly incorrectly, as *T. eugenii*. To these representatives of the protean *dama* type must now be added another insular form, long known to be in existence but only recently examined critically.

This is a gracefully-built wallaby of a general grizzled silver-grey colour. It differs from the Kangaroo Island Wallaby in being more finely built and considerably less sturdy. The head is small in proportion to the body, and the whole animal elegant compared with the thick-set wallaby of Kangaroo Island. The coat has a texture altogether different in that it is fine, rather short and sleek, and lacks the woolly or fluffy appearance typical of the last species.

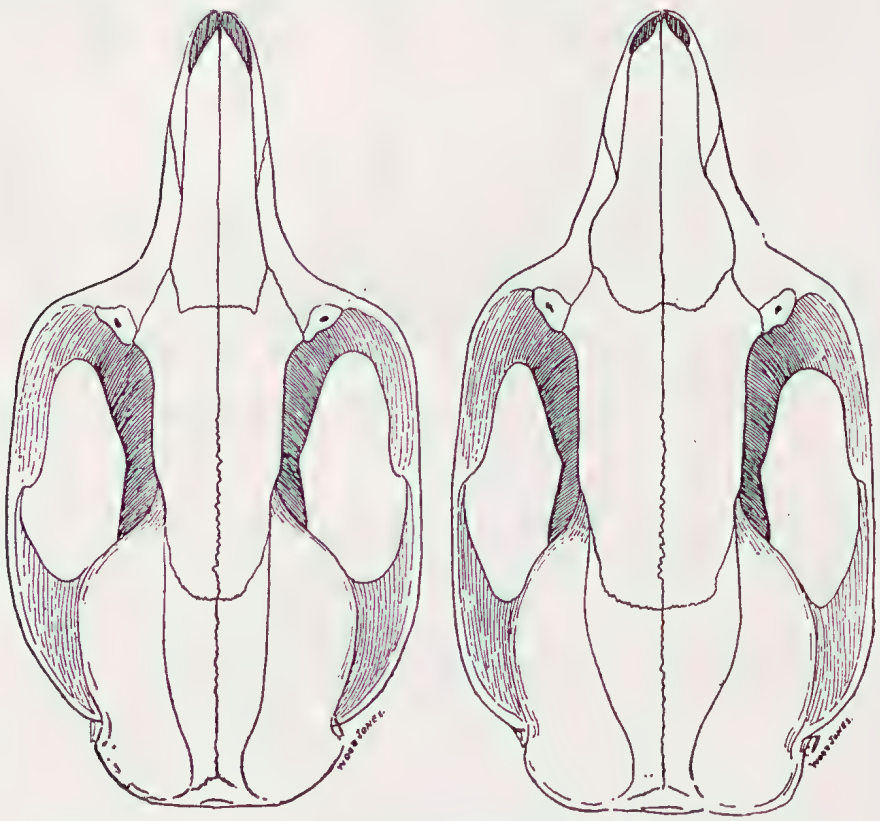

FIGURE 171.—Skulls of Flinders Island Wallaby (left) and Kangaroo Island Wallaby (right). The skulls are both of females and are of the same basal length. Natural size.

In general colour it is markedly grizzled light-grey, becoming strongly rufous over the shoulders in the male. The hairs of the mid dorsal region measure 20 mm., and the long entirely black hairs, which are so conspicuous in the last species, are entirely absent. The individual hairs are banded with white instead of buff, and the majority of them lack the dark tip.

The face is grey, with a well marked pale area extending along the upper lip to beneath the eye. Dorsal surface of the body pepper-and-salt grey. Sides and back of neck and shoulders rather bright rufous in the male, tawny in the female. Upon the occiput there starts a dark mid dorsal stripe; this stripe is very pronounced in the male and may be traced to the lower dorsal region. Chin and throat greyish-white; but the lower part of the neck, chest, and abdomen coloured almost as the dorsal surface, save that the pepper and salt mixture is somewhat lighter. Limbs pale fawn. Tail pale grey.

In the living animal the ears are pinkish-yellow within and but little hairy, without they are clothed by dark-grey hairs. Vibrissae, etc., as in the Kangaroo Island Wallaby.

The skull is lightly built and is at once distinguished from that of the last species by the narrow nasal bones, the outer margins of which are straight or nearly so, in contrast to the sinuous outer margins of these bones in the Kangaroo Island Wallaby. The average breadth of the nasal bones is 13·7 mm. in *flindersi*, as opposed to 19 mm. in the Kangaroo Island Wallaby. The constriction of the interorbital region is also considerably narrower than that typical of the latter animal. In *flindersi* the average minimum breadth of the interorbital constriction is 14·2 mm., as opposed to 17·1 mm. in the other species. (*See* Figure 171.) In the form of the nasal bones *T. flindersi* resembles *T. billardieri*.

DIMENSIONS.

	♂ Type of Species.	♀
Head and body	570	510
Tail	410	340
Hind foot	132	118
Ear	47	50

DIMENSIONS OF SKULL.

	♂ Adult Type.	S.A. Mus., No. M.1751.	♀ Adult.	Adult.	Adult.	S.A. Mus., No. M.1750.	♂ Adult.	S.A. Mus., No. M.1749.	Adult. ♂
Basal length	95	92	88	87	85	85	84	84	79
Breadth	53	49	49	49	49	49	—	46	47
Nasals, length	38	36	34	34	34	32	—	34	33
Nasals, breadth	16	16	12	14	13	12	—	14	13
Interorbital breadth	14	14	13	14	14	15	14	15	15
Palate length	59	51	53	54	51	50	50	50	49
Diastema	20	19	17	19	19	19	17	17	19
M^1—M^3	18	17	18	16	18	16	18	15	15

This beautiful wallaby is confined to Flinders Island, one of the Investigator group of islands at the eastern end of the Great Australian Bight. At the present time it is restricted to a very small area of the island.

Flinders observed this animal in 1802, and he records that on the island "a small species of Kangaroo, not bigger than a cat, was rather numerous. I shot five of them, and some others were killed by the botanists and their attendants and found to be in tolerably good condition." Even comparatively recently the animal was very numerous, and it has been reported that as many as thirty thousand were killed on the island. In 1910 a destructive bush fire swept the portion of the island occupied by the wallabies, and when I visited the place in 1920 no traces of it were to be found, and the tenant of the island believed it to be extinct. In 1922 I again visited the island and found obvious evidences of its presence, but no actual specimen was seen. In 1924 the little colony had considerably increased, and two specimens were secured for study purposes. The present small colony of wallabies occupies only a very limited area upon which the native bush has not been destroyed by various attempts at cultivation. Although the colony probably contains a hundred or so individuals its hold on life cannot be considered a very secure one. It is always at the mercy of bush fires, having no line of retreat, since it lives on a corner of the island that is girt by high and inaccessible cliffs. Moreover, it has to contend against two introduced animals, the feral domestic cat, which has overrun the island, and the food-destroying rabbit. It may at any time, though fortunately this does not seem to be at present the case, have to contend against human enemies. In January, 1924, the young were entirely independent of their mothers. On account of its build being rather more elegant than that of the thickset Kangaroo Island wallaby it was at one time a favourite with people who cared to have wallabies running in their grounds, but at present I believe there are no descendants of these animals living on the mainland. It has also been an inhabitant of the Zoological Gardens in Adelaide, but no specimens have been exhibited there for many years. A former tenant of the island has assured me that when the wallabies were numerous there were two distinct types living in the island, the one obviously that described as *Thylogale flindersi*, and the other a more rare, slender, yellow wallaby. What this second species was it is impossible to guess; there seem to be no traces of it left.

(3) Rufous-bellied Wallaby.

THYLOGALE BILLARDIERI (Desmarest, 1822).

In the collection of the British Museum there is a skull of this animal, formerly the property of Sir Richard Owen, which came from Mount Gambier. There are also two skeletons said to have been procured in South-east South Australia.

This small wallaby is distinguished by its short ears, stout form, and its long coat, which is dark-greyish-brown on the dorsal, and yellowish, or rufous, on the ventral surface. Face markings are absent, save for a faint pale-yellowish line which runs along the upper lip. The tail is very short, being only about two and a half times as long as the head, and only about half the length of the head and body. In the skull the nasal bones have straight outer edges, each bone being wedge-shaped.

DIMENSIONS.

	Tasmania. ♂ Stuffed. Brit. Mus.	Paris Mus.
Head and body	650	525
Tail	360	220
Hind foot	135	120
Ear	40	35

DIMENSIONS OF SKULL.

	Brit. Mus. ♂ Tasmania.	Brit. Mus. ♀ Islands of Bass Straits.
Basal length	99	95·5
Breadth	56	54
Nasals, length	39	36
Palate length	62·5	57·5
Diastema	24	22

This is the common small wallaby of Tasmania, it is present also in some of the islands of Bass's Straits and on the mainland of Victoria. Evidently it was at one time an inhabitant of the South-eastern portion of this State, where the Platypus and the Koala intruded into the South Australian fauna. If it still lingers in any corner of the South-East, I have been unable to ascertain. I know of no South Australian specimens, the Museum at Mount Gambier possessing no relic of the animal. It is a highly gregarious wallaby, and lives in Tasmania in large communities. Should a South Australian colony of the Rufous-bellied Wallaby still exist it is much to be desired that adequate protection be afforded to it.

Sub-Genus II.—Wallabia (Trouessart, 1905).

The larger wallabies contained in this section are characterised by possessing a pes which measures from 160-250 mm., and a skull the basal length of which is from 108-130 mm. As a group they constitute the most beautiful section of the large Genus *Macropus*, all of them being finely built and graceful animals, and many of them being rather distinctly, even brilliantly, marked and coloured. Seven or eight species are contained within the group; and it is a matter of the greatest difficulty to determine what species inhabit, or have inhabited, this State. After a great deal of inquiry (in the course of which 900 filled-in forms have been received from the scholars in various State schools) there is only definite evidence that two species are now living within the confines of this State, and of these species, one, the Toolach (*W. greyi*), is represented by less than half a dozen individuals. The other species, the Red-necked Wallaby (*W. rufogriseus*), inhabited South Australia in large numbers not long ago, but only a few are now living in the South-East. Of a third species, the Black-tailed Wallaby (*W. bicolor*), there are no records in the form of specimens or references in the literature; but on the evidence of reliable observers it is included here as a South Australian animal.

No elaborate table is required to separate these three species since their external characters are very distinct and obvious.

(A.) Coat colour grey fawn. Tail pale-grey with a white tip. Conspicuous face marks. 1. *W. greyi.*

(A¹.) Coat colour grey rufous, neck bright rufous. Tail grey, with a darker tip. Face markings inconspicuous. 2. *W. rufogriseus*

(A¹¹.) Coat colour dark rufous. Tail black. Face markings indistinct. 3. *W. bicolor.*

(1) Toolach Wallaby, Grey's Wallaby.

Wallabia greyi (Gray, Waterhouse, 1846).

Probably the most beautiful and elegant of all the wallabies, and very markedly distinct from every other form. Distinguished at once by its bold face markings, its banded hinder dorsal region, and its general grey fawn colouration. In general build it is light and elegant; in general colour a fine pale grey admixed with fawn. The coat is thick and rather woolly, the fur, especially over the lower portion of the back, having a somewhat crimped appearance. The face is boldly marked, a dark stripe running as a whisker mark from the muzzle to the lower border of the eye and beyond as a narrow tongue towards the ear. The muzzle, dorsal to the dark cheek stripe, is grey, changing to fawn on the crown of the head and at the base of the ears. Below the dark cheek stripe the upper lip is pale, almost white, the pale area extending past the eye and towards the ear, and then curving dorsally to form an almost white patch above the eye. The crown of the head, neck, and shoulders are delicate fawn. The ears are large and fawn coloured, both within and without. The region of the shoulder and upper part of the fore limb grey. Fore arm pale-fawn, the digits themselves being dark, almost black, in colour. The hind limb grey, with a not very well defined paler hip bar. The lower part of the hind limb pale-fawn, the digits being dark. The dorsal surface of the body fawn as far as the shoulders, and from there caudad, becoming more distinctly grey. From a point somewhat in front of the costal margin to the root of the tail the back is distinctly banded (though the bands are not equally conspicuous in all lights) with alternate bars of lighter and darker grey. These bars are marked not only by their colour, but by the texture of the fur, and as a rule some ten or twelve bands may be detected. The ventral surface is pale fawn, this colour extending to the front of the hip, anterior to the pale hip bar. The tail is pale grey, and it becomes distinctly paler towards its tip.

Figure 172.—Anterior part of skull showing incisor teeth of *Wallabia greyi*. Natural size. Specimen S.A. Mus., M. 1762.

The skull cannot be confused with that of any other wallaby when regard is paid to its general form and its remarkably small second and third incisor teeth. (*See* Figure 172.) The brain case is small, and relatively the nasal portion of the skull is excessively large. The nasal bones are broad and much expanded behind. The interorbital region is very broad, parallel sided, and with sharply angulated margins. All the teeth, with the exception of the first upper incisor, are extremely small; the second and third incisors are minute when comparison is made with the skull of any other wallaby which attains anything like the same general size.

DIMENSIONS.

The measurements are of mounted animals in the British Museum.

	♂	♀
Head and body	810	840
Tail	730	710
Hind foot	212	216
Ear	65	71

DIMENSIONS OF SKULL.

	♂ No. 1762, S.A. Mus.	♀ Brit. Mus.	♂ Brit. Mus.	No. 1761, S.A. Mus.	No. 1760, S.A. Mus.
Basal length	118	114	111	110	110
Breadth	59	64	63	58	59
Nasals, length	57	57	55	52	50
Palate length	75	75	74	69	68
Diastema	33	35	33	31	30
Length of I^3	4·5	—	4·4	4	4·5

The Toolach has always been confined to the South-eastern portion of South Australia. Since the animal is such a very distinct one, and an inhabitant of open country, it has for very many years been particularly well known, and many people can remember the time when Toolaches swarmed in the neighbourhood of Kingston. Being by far the fleetest of all the wallabies, its chase was at one time a very popular form of sport, and its beautiful pelts have been marketed in very large numbers in the salerooms of Melbourne. Its mode of progression, as well as its distinctive face markings, rendered it easy to recognise, since it had the peculiarity of taking two short hops and one long one. It is not correct to say that this very fine and distinctly South Australian wallaby is extinct, for at the present moment five or six individuals still exist. Any effort to preserve this remnant must be made immediately and with vigour if it is to be of any service whatever.

(2) **Red-necked Wallaby.**

WALLABIA RUFOGRISEUS (Desmarest, 1817).

This is the animal usually described as *Macropus ruficollis* (Desmarest, 1817), or as *M. ruficollis var. typicus*. The name *ruficollis* was given by Desmarest to animals from King Island, and *rufogriseus* to mainland specimens; and this latter name is therefore retained. Besides the King Island and the mainland forms,

there is another variety, the common large wallaby (often termed kangaroo) of Tasmania, which is known as *bennetti* (Waterhouse, 1837).

As far as South Australia is concerned the material available for study is represented in the State Museum by a single skull (No. M. 1758) from Mount Gambier. For the external characters, therefore, previously published accounts of the mainland form are drawn on.

Size large, the animal being the largest member of the Sub-genus. Form slender and graceful. General colour greyish fawn, becoming bright rufous on the back of the neck and over the hind quarters, the centre of the dorsal region being more distinctly grey. Some specimens show an indistinct paler hip bar. The face markings inconspicuous, dorsal surface of muzzle dark brown, connecting two lateral darkish cheek stripes, below which are paler areas bordering the upper lip and ending just below the eye. Crown of the head rufous grey. Ears long, their backs rufous, becoming darker towards the tips. Manus and pes grey, darkening almost to black over the digits. Chin, chest, and ventral surface of the body greyish white or white. Tail grey above and paler below, the tip being dark brown or black. The skull has a large brain case and a comparatively short nasal region. Nasal bones short, and ending some distance from the front of the premaxillae. (*See* Figure 173.) Incisor teeth large and powerful; I^3 large, with a strongly marked notch at the centre of its cutting edge. (*See* Figure 173.)

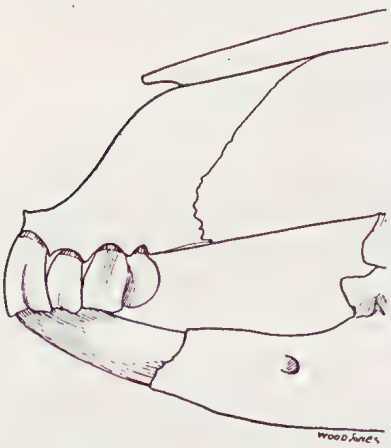

FIGURE 173.—Anterior part of skull showing incisor teeth of *Wallabia rufogriseus*. Natural size. Specimen S.A. Mus., M. 1758.

DIMENSIONS.

	Stuffed. Brit. Mus. ♂ New South Wales.	Stuffed. Brit. Mus. ♀ New South Wales.
Head and body	1,050	925
Tail	750	700
Hind foot	230	220
Ear	78	76

DIMENSIONS OF SKULL.

	Brit. Mus. Mount Gambier.	S.A. Mus. Mount Gambier.
Basal length	122	120
Breadth	64·5	62
Nasals, length	54	45
Palate length	80	73
Diastema	34	26
Length of I^3	8·6	8·5

Apparently this animal was extremely abundant in the South-East only a few years ago; but to-day its numbers are reduced to no more than a few stray individuals. In the British Museum Catalogue of 1888 four skulls in the collection are recorded as being from Mount Gambier; and in the South Australian Museum there is a single skull from Mount Gambier. *W. rufogriseus* is a southern form, and its range stretches through southern New South Wales and Victoria into South Australia, and from the mainland into the islands of Bass's Straits and into Tasmania.

(3) Black-tailed Wallaby.

WALLABIA BICOLOR (Desmarest, 1803).

This is a heavy, dark coloured wallaby, generally known as *Macropus ualabatus* (Lesson & Garnot, 1826), or as *M. ualabatus var. typicus*. Since there appears to be no doubt that Desmarest's name applied to this animal, it is here adopted in preference to the later name given by Lesson and Garnot. No South Australian specimens are preserved so far as I am aware, and therefore the description here given is derived from previously published accounts.

General form thickset and robust. Fur long, thick, and coarse; coat almost shaggy in texture. General colour dark rufous grey, the hinder part of the body being more rufous than the fore part. The patch of hair around the base of the ears, the chin, and chest, and ventral surface of the body pale rufous or yellowish. Face markings inconspicuous. Ears short, coloured like the head. Fore limbs and sides of body grizzled dark grey. Manus and pes brown, digits black. Tail black, sometimes grizzled towards its root.

DIMENSIONS.

	New South Wales. ♂ Skin. Brit. Mus.	New South Wales. ♀ Stuffed. Brit. Mus.
Head and body	820	815
Tail	650	650
Hind foot	208	187
Ear	59	63

DIMENSIONS OF SKULL.

	New South Wales. ♂ Brit. Mus.	Victoria. ♀ Brit. Mus.
Basal length	127	110
Breadth	68	65
Nasals, length	57	47
Palate length	81	69
Diastema	30	22·5
Length of I^3	8	—

I know no specimen obtained in South Australia, and include a brief description of the species solely because observers who know the animal in Victoria

have informed me that it occurs in certain parts of the South-East. This occurrence is likely, and probably this species inhabited, or inhabits, that tract of country (South Australian in political boundary, but Victorian in faunal likeness) in which the Rufous-bellied Wallaby, the Koala, and the Platypus have been found.

Sub-Genus 3.—Macropus (*sens. strict.*).

The animals contained in this Genus are the big bulky creatures known as Kanroos, Wallaroos, and Euros. They are banded together mainly on account of their size, and owing to the fact that the group has been studied from isolated specimens in European Museums rather than in the mass in Australia, the question of their species and varieties has become an extremely involved one. Looking at the restricted Genus *Macropus* from the broad point of view of adaptation and environment it may be said that three types are contained within it. (1) The type of animal which lives in high rock-strewn ranges ; this type is here termed the *robustus* type. (2) The type which lives in open plains ; this type is here termed the *rufus* type ; and (3) the type which lives in country characterised by dense scrub and open glades ; this type is here termed the *giganteus* type. Since the environments of rocky ranges, open plains, and scrub lands are widely represented in all Australian topography, each type of animal possesses a very wide geographical range. As is usually the case in widely ranging types, considerable variation is displayed in individuals representative of the scattered districts of their habitat. Moreover age, sex, district, and season are all factors which exert a considerable influence upon the pelage of the animal. To examine a few skins in a museum is an experience altogether different from visiting a warehouse where skins lie exposed during the skin sales. There are varieties unending of Euros, Reds, and Greys, and moreover many of these varieties will be present in one parcel of skins collected in a fairly restricted area. Here, then, we will be somewhat conservative of scientific names and recognise three main types, and of one of the types two species so far as South Australia is concerned, a continental species, and an insular species. Again, it must be emphasized that though the recognition of "euros," "reds," and "greys" may not be always easy from an examination of the mere dried pelt, there is never any doubt as to what species any kangaroo belongs if only one glance may be had at the tip of its nose. The euro has a large naked black end to its nose, very much after the fashion of a dog. The red kangaroo has its nostrils ringed with naked black skin and separated from each other in the middle line by naked black skin. The grey kangaroo, and the Kangaroo Island kangaroo have the nostrils narrowly ringed with naked black skin, but the tip of the nose between the nostrils is soft and hairy. Apart from these external characters, the features of the skull at once separate the three types with the utmost certainty, the skulls being so easy to differentiate by obvious characters that every blackfellow and most white men with a good knowledge of outback life can readily tell them apart. It must always be remembered, however, that cranial characters can only be determined from the examination of a large number of skulls, and in many cases species have been established upon the evidence of an individual or a few individuals. Such species as *M. antilopinus* (Gould, 1841), *M. bernardus* (Rothschild, 1904), *M. hagenbecki* (Rothschild, 1907), *M. isabellinus* (Gould, 1841), *M. magnus* (Owen, 1874), and the many sub-species mentioned later need the examination of far more material to

establish their specific or sub-specific validity. The cranial characters defined here are all determined from the examination of large numbers of crania. Cranial features which are very apparent are not always those which are most readily tabulated, and these will be separately mentioned or figured. Meanwhile the following table will serve to distinguish the South Australian species of the Genus.

External characters.—

(A.) Fur coarse and straight. Coat hairy and not woolly. Rhinarium entirely naked. 1. *M. robustus.*

(A^1.) Fur soft and woolly. Rhinarium only partly naked.

(B.) Rhinarium naked between the nostrils. Face markings present. 2. *M. rufus.*

(B^1.) Rhinarium hairy between the nostrils. Face markings absent.

(C.) Colour greyish-brown. Muzzle, digits, and distal half of tail brown. 3. *M. giganteus.*

(C^1.) Colour sooty-brown. Muzzle, digits, and distal half of tail black. 4. *M. fuliginosus*

Cranial characters.—

(A.) Length of nasals but little more than twice the maximum depth of the zygoma. Muzzle region with almost parallel sides. 1. *M. robustus.*

(A^1.) Length of nasals three times, or more, the depth of the zygoma. Muzzle region tapering towards the tip.

(B.) Anterior palatine foramina at mid point, or anterior to mid point, of incisive canals. I^3 with one inconspicuous external notch, considerably shorter than 1^1 and 1^2 combined. 2. *M. rufus.*

(B^1.) Anterior palatine foramina altogether behind the incisive canals. I^3 with two external notches, equal to or slightly shorter than I^1 and I^2 combined. 3. *M. giganteus.*

(B^{11}.) Anterior palatine foramina at posterior ends of incisive canals. I^3 with two or three external notches, equal to or longer than I^1 and I^2 combined. 4. *M. fuliginosus.*

(For details of the anterior palatine foramina, *see* Figure 174).

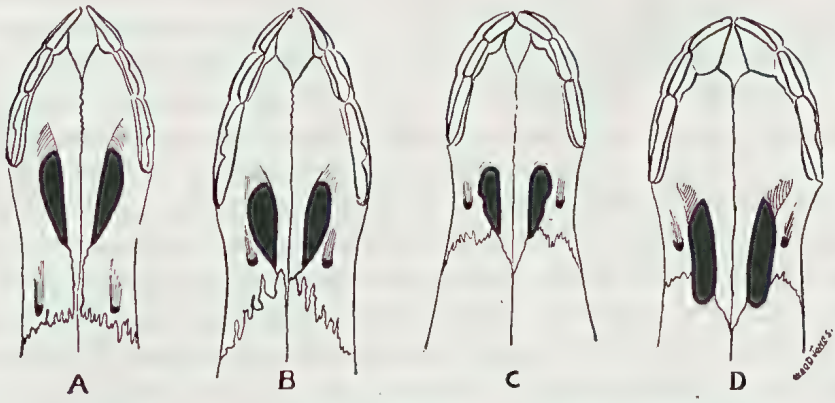

FIGURE 174.—The anterior end of the palate, with the incisor teeth of the four large kangaroos. Natural size. A. *Macropus giganteus.* B. *Macropus fuliginosus.* C. *Macropus robustus.* D. *Macropus rufus.*

(1) Euro: known in the Eastern States as Wallaroo.

MACROPUS ROBUSTUS (Gould, 1840).

This is the sturdily built, hairy coated, kangaroo of the ranges. The texture of the coat, the comparatively short and enormously strong limbs, and the naked black nose at once distinguish animals of the *robustus* type from any other of the large kangaroos. (*See* Figure 175.) When coat colour is taken into consideration, and variable and unessential characters are given undue prominence, a vast number of varieties or sub-species may be distinguished. In order to save the reader from confusion a list of the named varieties is appended.

(1) *M. alexandriae.* (Schwarz, 1910.)
(2) *M. alligatoris.* (Thomas, 1904.)
(3) *M. argentatus.* (Rothschild, 1905.)
(4) *M. bracteator.* (Thomas, 1911.)
(5) *M. cervinus.* (Thomas, 1900.)
(6) *M. erubescens.* (Sclater, 1870.)
(7) *M. isabellinus.* (Gould, 1841.)
(8) *M. reginae.* (Schwarz, 1910.)
(9) *M. rubens.* (Schwarz, 1910.)
(10) *M. woodwardi.* (Thomas, 1901.)

All these names are, or have been, applied to races or varieties of this species, and it is quite possible that this list does not exhaust the synonyms that have been bestowed upon the type *M. robustus*.

FIGURE 175.—Rhinarium of *Macropus robustus*.

The following is the description of what may be termed a typical South Australian animal. Size large, form stout and heavy and, if seen in an unwonted environment, apparently clumsy. Fur thick and coarse, and distinctly hairy as opposed to woolly. Under-fur thin and sparse. General colour a rather brilliant admixture of smoky blue and fox red. Face grizzled dark grey, cheeks darker than the region below and behind the eye. Margin of the upper lip pale grey. Shoulders rather bright rufous. The elbow with a dusky patch, which runs forwards along the side of the neck and separates the rufous dorsal from the dusky white ventral surface. General colour of dorsal surface changing from rufous over the occiput, neck, and shoulders, to smoky blue over the hind quarters. Ventral surface pale, grey white over throat and chest, smoky grey over lower costal region and upper part of abdomen, and grey white over lower portion of abdomen. Hairs around base of ears distinctly paler than general colour of face and head. Ears large and oval in outline, dark without and pale rufous within. Fore limbs, from the elbow downwards,

paler than general body colour; above the elbow they are dark. Manus dark grizzle. Digits themselves dark, almost black, in colour. Hind limbs paler than general body colour, often with an indication of a paler hip bar. Digits of pes dark, almost black. Eyelashes and vibrissae black. Young specimens are more markedly rufous than adults and old animals. Tail relatively short and extremely thick; dusky rufous in colour.

The skull of *robustus* is easily distinguished from that of any other kangaroo. It is characterised by being sturdily built and massive. The muzzle region is distinguished by the short, broad, nasal bones, and the lateral inflation of the whole of the snout. This lateral inflation causes the muzzle to taper very little towards its tip, and in this character the skull differs markedly from that of *M. rufus* and *M. giganteus*. This lateral swelling of the muzzle is more marked in old examples than in young ones. In fully adult males the muzzle region is commonly broadest anterior to its mid point; and the condition of the snout region which is described as differentiating the Antilopine Kangaroo (*M. antilopinus*) cannot be said to be one unmatched in the skulls of *M. robustus*. The zygoma of *robustus* is remarkably deep from above downwards, and this feature constitutes an outstanding characteristic of the skull at any age. (*See* Figure 176.) The foramen magnum is small when compared with that of other species, and this character is mentioned since it is the one by which kangaroo hunters can invariably tell the skull of *robustus* from that of *rufus*. Again, compared with *rufus*, the posterior narial apertures are particularly small. (*See* Figure 179.)

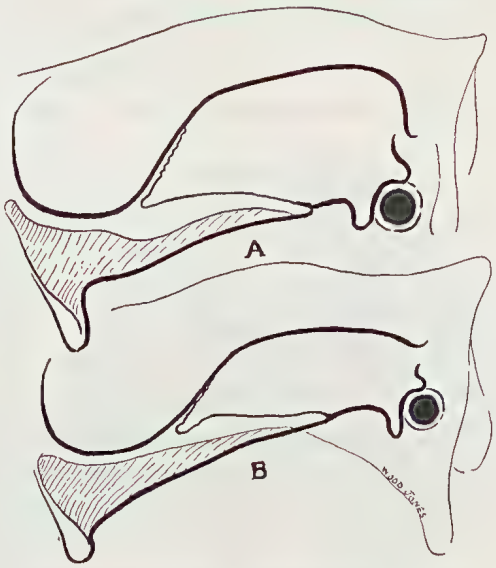

FIGURE 176.—Portion of the left side of the skulls of A. *Macropus robustus* and B. *Macropus rufus*. The figure shows the zygoma of each skull in order to illustrate the very characteristic form of this bar of bone in the two species. Half natural size.

The incisive canals are subject to some considerable variation, and no very hard and fast rules can be laid down. We may say that they vary in length from 8 mm. to 20 mm., and that they may or may not invade the maxillae.

The anterior palatine foramina open at some point along the length of the incisive canals, but their relative position naturally varies with the degree of posterior extension of the canals. (*See* Figure 174.)

The many other points of cranial architecture which are usually given as typical of the skull of *robustus* are unreliable. No other criteria than those already mentioned hold good when large series of skulls of the large kangaroos are examined. Nevertheless, though the points of absolute distinction here given are few, they are so constant that there cannot be the least doubt in determining the skull of *robustus* and in distinguishing it from any other well established species. In addition to this, one dental character separates *robustus* from all the other large kangaroos.

The incisor teeth are simple and their enamel-covered area is very short from above downwards. These stumpy incisors with their short enamel surfaces are diagnostic of *robustus* and, in general, it may be said that the second incisor tooth has the enamel-covered portion about as long as broad, and the third incisor shows an enamel area twice as broad as it is long. (*See* Figure 177.)

AVERAGE DIMENSIONS OF ADULT MALES.

Head and body	*c* 1,300
Tail	900
Hind foot	310
Ear	95

DIMENSIONS OF SKULL.

The following measurements are of a series of nine adult skulls from Bimbowrie :—

	No. 15.	No. 1.	No. 8.	No. 11.	No. 3.	No. 7.	No. 2.	No. 10.	No. 14.
Basal length...	182	182	177	176	175	174	172	172	170
Breadth	100	96	97	95	95	100	92	92	92
Nasals, length	74	75	66	74	77	76	68	72	67
Palate length	117	117	115	112	115	115	111	110	109
Width of zygoma	33	28	29	29	28	33	29	28	25
Breadth of I^3	7·5	7·5	7·5	7·5	8	7	—	8	8

The Euro is not by any means an abundant animal in South Australia. From most of the ranges nearer the more settled areas it has either been exterminated, or has been greatly reduced in numbers. Nevertheless the remnant will probably survive for long, since the animal inhabits the most inaccessible and the least desirable tracts in South Australia. It is only the kangaroo shooter who earns a living, or adds to his income, by obtaining pelts who is a real threat to the survival of this animal. But for him it might remain for ever in its rock-strewn ranges, where it does no damage either to the agriculturalist or the grazier. From the rejecta of the kangaroo shooter Mr. Coulston, of Bimbowrie, has rescued a series of forty- two perfect skulls for study purposes; and this is an example which it is much to be hoped will be imitated by others having like opportunities. All over Australia kangaroo skulls may be found at the camp sites of the men who have flayed the animals for their pelts. It is high time these skulls were collected and preserved, for the material at present stored in our museums is quite inadequate for the proper study of the cranial characteristics and the range of variation of any species.

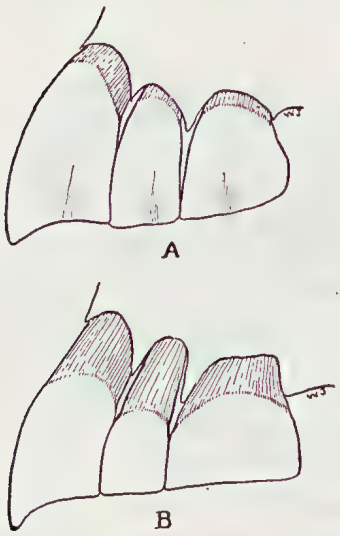

FIGURE 177.—Upper incisor teeth of the left side of A. *Macropus rufus* and B. *Macropus robustus*. The skulls are of the same length and the animals the same age. Twice natural size.

The Euro lives as a rule in small communities, since its food is usually not abundant in the habitat of its election. Its station is probably determined mostly

by the proximity of some rock hole where water is to be obtained. It is a sturdy, stubborn creature, which will put up a determined fight, and which does not adapt itself so readily to captivity as do the other large kangaroos. In its wild state it is far more cunning than the other kangaroos, and when alarmed is an adept at seeking cover. When startled it has the habit of going straight ahead for safety, and not stopping till it is well out of sight. In this it differs from the other species which usually stop after a short flight and take a look at the object which has startled them.

(2) Red Kangaroo, female known as Blue Doe or Flying Doe.

MACROPUS RUFUS (Desmarest, 1822).

The Red Kangaroo is the large, gracefully built kangaroo of the plains and table lands, which ranges, in such country, practically from one side of Australia to the other, its territory being more restricted on the west than on the east.

FIGURE 178.—Rhinarium of *Macropus rufus*.

The colour and texture of the coat, and the nature of the face markings, and the characters of the rhinarium at once distinguish it. Nevertheless, a variety of names is applied to the *rufus* type, either as the distinctions of local races or of mere individual, seasonal, age, or sex variations. Of these names we may enumerate the following :—

(1) *M. occidentalis.* (Cohn, 1906.)
(2) *M. magnus.* (Rothschild, 1907.)
(3) *M. pallidus.* (Schwarz, 1910.)
(4) *M. laniger.* (Gaimard, 1823.)
(5) *M. griseo-lanosus.* (Quoy and Gaimard, 1825.)
(6) *M. lanigerus.* (Gray, 1827.)
(7) *M. pictus.* (Gould, 1860.)
(8) *M. ruber.* (Crisp, 1862.)
(9) Probably *M. magnus.* (Owen, 1874.)
(10) *M. dissimulatus.* (Rothschild, 1905.)

The following description applies to typical South Australian specimens. Size large, form slender and graceful, limbs slender ; the animal being much more finely built than *M. robustus*. Fur short, close, and soft, there being no long hairs in the texture of the coat. On most parts of the body the coat can be brushed in either direction, there being no very decided slope to the hairs.

The head is characterised by its large bow nose, terminating in a characteristic naked rhinarium, which is very sharply delimited. (*See* Figure 178.) The texture

of the skin of the rhinarium is coarsely granulated and in colour it is dusky, but not shiny, black.

The general colour of the adult male is bright rust red. Face grey, with a well marked black whisker mark, below which is a white area bordering the upper lip. Head, shoulders, and the whole of the dorsal surface of the body, bright rusty red, turning to grey on the sides and to white on the ventral surface. In some specimens the rufous colour invades the ventral surface below the costal margin. Limbs pale, rufous at shoulder and hip, cream coloured at ankle and wrist, digits dusky. Tail rufous above and pale beneath. Ears long, clothed with rufous hairs without and with pale fawn hairs within. Iris dark-brown; black eyelashes abundant. Facial vibrissae black.

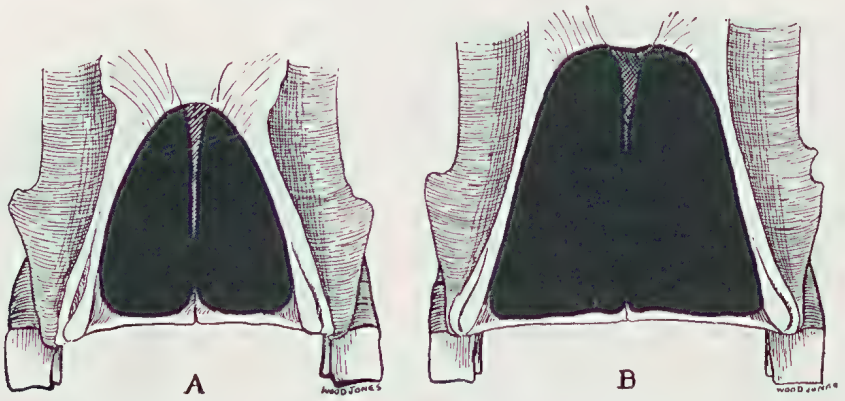

FIGURE 179.—The back end of the nasal chambers of A. *Macropus robustus* and B. *Macropus rufus*. The skull is viewed from its hind end, and the drawing includes the last molar teeth, seen at the sides of the base of the figures. Natural size.

The female, when adult, is a beautiful smoky blue in those parts where the male shows the bright rufous colouration. Young animals of both sexes show a rather strange admixture of smoke blue and rufous, the individual hairs being pale rust colour at the roots and smoky-blue at the tips. The brilliant colouration of the living animal fades rather remarkably in the dried skin.

The skull of *rufus* is readily distinguished. It is not so stoutly built as that of the *robustus* type, and its most outstanding feature is the great size of the nasal chambers. This character is made apparent in the enormous size of the posterior openings of the nasal chambers and in the great width of the back end of the palate behind the molar teeth. (*See* Figure 179.) From *robustus* it is distinguished by its relatively narrow zygoma (*see* Figure 176) and by the long enamel area of the simple third incisor tooth (*see* Figure 177), whilst the simplicity and small size of this tooth at once distinguishes it from *giganteus*, from which it is also distinguished by the site of the naso-palatine foramina. (*See* Figure 174.)

AVERAGE DIMENSIONS OF ADULT MALES.

Head and body	c. 1,600
Tail	1,000
Hind foot	350
Ear	110

DIMENSIONS OF SKULL.

The following measurements are of a series of nine adult skulls from Bimbowrie :—

	No. 15.	No. 17.	No. 19.	No. 14.	Aged. No. 18.	No. 24.	Aged. No. 16.	No. 20.	Aged. No. 13.
Basal length	204	201	200	199	198	198	197	176	171
Breadth	103	100	98	97	99	98	101	89	85
Nasals, length	79	89	86	73	91	84	78	73	70
Palate length	127	125	125	124	125	123	124	113	110
Width of zygoma .	23	24	23	22	23	22	23	20	16
Breadth of I^3	7	7	7	9	5	9	—	6	5

Although the Red Kangaroo has a wide range in South Australia, it cannot be considered as a common animal. Its movements are, at the present day, so restricted by fences that its temporary abundance in any one locality cannot be taken as an index of the numbers of the animal still living. Its greatest enemies are drought and mankind. Fences act adversely on its free migrations, which in past times enabled it to escape from drought-stricken areas and seek country where green food was still to be had.

From droughts it now has little chance of escape ; from man, under modern conditions, it has still less. In the old days when it was hunted by dogs and ridden down on horseback, its fleetness would often prove its safeguard ; to-day, when the thoroughly unsportsmanlike method of employing motor cars in the chase is adopted, its chance of escaping a rifle bullet is very small indeed. Though very fast, it is a somewhat foolish animal, and its habit of going off at top speed and then stopping, whilst it looks around at the source of danger, is a fatal one. Practised kangaroo shooters, who obtain pelts for the market, account for vast numbers every year, and there is no doubt that the demands of the leather and fur trades, the practice of the so-called sport of shooting from motor cars, and especially the cutting up of large unfenced holdings into smaller fenced ones, is threatening the continued existence of Australia's finest kangaroo.

The Red Kangaroo is a fine, plucky, animal, which is always ready to defend itself at close quarters. In captivity it does well, and often exhibits a truculent familiarity which, on the part of a large male, is apt to be embarrassing or even dangerous. It breeds only once in the year, the single offspring running with the mother as a rule in January.

(3) Grey Kangaroo. Scrub Kangaroo.

MACROPUS GIGANTEUS (Zimmermann, 1777).

The Grey Kangaroo is the large, graceful, woolly-coated kangaroo of the scrub lands and bush country. Its hairy nose (*see* Figure 180) and its long, soft, grey-brown fur at once distinguish it from *robustus* or *rufus*.

The fur is soft and woolly, and has in general a roughed-up appearance owing to the varying nature of the hair trend in different parts of the body.

The typical South Australian animal is dusky grey brown over the head, dorsal surface of the body, and tail, and light-grey or almost white on the ventral surface. The muzzle and face are dusky brown, the crown of the head and cheeks rather

more rufous. The backs of the ears are clothed with grizzled grey-black hairs, each hair being banded with white and dark brown. The inner surface of the ears clothed with light-grey or almost white hairs. Outer side of fore limbs grizzled brown, inner side almost white. Manus, wrist, and fore arms clothed with short grizzled fawn hairs, the digits themselves being dusky. Hind limb pale fawn, becoming grizzled over the base of the digits and dusky brown over the tips. Nails uniform brown black. Tail brown, darkening towards the tip, which is dark brown, in some specimens almost black.

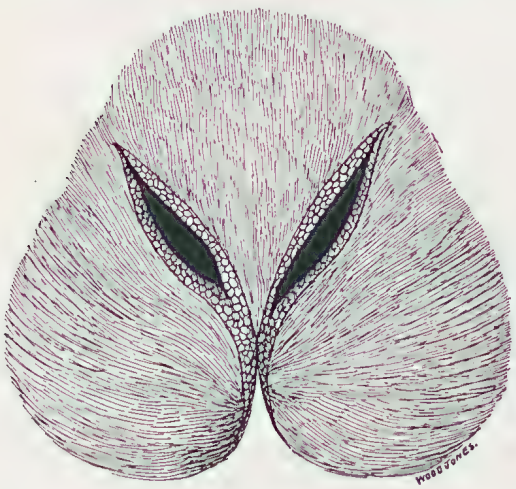

FIGURE 180.—Rhinarium of *Macropus giganteus*.

The tip of the nose between the nostrils is clothed with fine brown hairs, only the margins of the nostrils themselves being ringed with naked black skin. (*See* Figure 180.)

The iris is very dark brown. The eyelashes are long and black. All facial vibrissae well developed and black in colour.

The female is coloured like the male, but is, as a rule, much smaller.

The skull is easily distinguished from that of either *robustus* or *rufus* by the characters of possessing small posterior openings of the nasal chambers, combined with a comparatively narrow zygoma and naso-palatine foramina situated behind the incisive canals. (*See* Figure 174.) From these two forms it is also readily distinguished by the large size of its doubly grooved third incisor tooth. (*See* Fig. 182.)

AVERAGE DIMENSIONS OF ADULT MALES.

Head and body	♂ 1,500
Tail	925
Hind foot	330
Ear	100

DIMENSIONS OF SKULL.

	South Australian Museum Specimens—Adult Males.				Series of Young Adult and Young South Australian Skulls.						
	No. 1871.	No. 1975.	No. 1873.	No. 1874.	G 4.	G 5.	G 3.	G ♂ 6.	♀ G 2.	♀ G 7.	♂ G 1.
Basal length	198	193	192	181	177	177	174	172	153	150	112
Breadth	94	98	95	93	89	89	85	89	82	76	65
Nasals, length	73	82	78	73	71	76	74	70	67	60	44
Palate length	130	128	125	120	116	114	113	113	100	96	70
Diastema	59	60	59	55	57	55	56	51	47	44	27
Length of I^3	10	9	10	9	11	—	—	11	11	10	10
Width of back of lower jaw	83	—	90	—	88	87	81	85	77	74	59

Grey Kangaroos which live in the more inland and less fertile portions of the State are, as a rule, smaller, more lightly built, and darker in colour than those which inhabit the timbered districts near the coast. These small, dark, animals are known as Black-faced Kangaroos—*Macropus melanops* (Gould, 1842)— or as *M. giganteus var. melanops*, but their claim to rank as a distinct species appears to be rather slender.

Although the Grey Kangaroo still exists in considerable numbers in suitable country, it seems likely that it is in greater danger of extermination than either the Red Kangaroo or the Euro. This is partly for the reason that it is not such a hardy or resourceful animal as the other large kangaroos, and partly because it inhabits better country, where it is sooner brought into opposition with the settler.

It is a shy, but rather stupid and inquisitive animal, which stands urgently in need of protection. In captivity it is gentle, but nervous ; and it readily looses its head if alarmed. It is extremely docile, being far more gentle than *rufus* and far more tractable than *robusta*. It has a curious habit of shivering the skin over the whole of its body when apprehensive, and when suddenly alarmed it becomes so unreasoning that it will hurl itself into fences regardless of the consequences to itself. It breeds only once in the year, and only one young is produced at a time.

The young is usually running with its mother towards the end of December.

(4) Sooty Kangaroo. Kangaroo Island Kangaroo.

MACROPUS FULIGINOSUS (Desmarest, 1817).

This is the large, dark, scrub-haunting kangaroo which inhabits Kangaroo Island. The animal was originally described by Desmarest, and an extended description of the species, written from recently collected material, is as follows :--

Size large, the adult males being considerably larger and more heavily built than even the largest specimens of *M. giganteus*. Form robust, even clumsy, the old males appearing as almost gigantic lumbering creatures. The general colour is a dull, dark, sombre brown, the general colouration being considerably darker than that typical of *M. giganteus*. The fur is devoid of sheen, and the appearance might be described as dusty. The mid dorsal line is considerably darker than the sides of the body. The individual hairs of the mid dorsal region averages 25 mm. in length ; they are dark smoky brown at the base and lighter at the tips. At the sides of the body the hairs reach a length of 55 mm. and each hair is dull smoky brown at the base and pale dull brown at the tip. The hairs of the mid dorsal region are straight ; those at the sides of the body are crenated, and give the coat a shaggy appearance.

The shoulders and the costal region are somewhat paler than the region of the sides of the abdomen and loin. The ventral surface of the body is clothed with hair upwards of 40 mm. in length, dark smoky brown at the base, and white, dirty white, or pale brown at the tips. The crown of the head as far forwards as the middle of the eye, is dark brown, being darkest in the middle line. The cheeks somewhat lighter. From the middle of the eye to the extremity of the rhinarium the colour becomes increasingly dark, the muzzle itself being nearly black. The chin is dark, the colour becoming paler further back so that the throat becomes increasingly white by the admixture of pale tipped hairs. Outer side of the limbs

dark brown, conspicuously grizzled with white-tipped hairs. Inner side pale brown. A dark patch is rather conspicuous over the region of the elbow. Lower part of forearm increasingly dark in colour, the white-tipped hairs ceasing about the middle of the forearm. Wrist and manus black.

Hind limbs dull-brown. Pes clothed with short hairs, which become paler at the margins of the soles. From the base of the digits, onwards to the tips, the light-brown hairs give way to dark brown and finally to black, the large fourth digit being entirely black.

The tail is enormously thick and relatively short, its great girth being maintained for the greater part of its length. On the dorsal surface the base of the tail clothed with dark-brown body hairs; this soon gives place to short, closely adpressed brown hairs, which become increasingly dark as they are traced distally. The terminal half, or more, of the dorsal surface and sides of the tail clothed with glossy, closely adpressed black hairs. The ventral surface of the tail has what almost amounts to a ventral crest of coarse, harsh, longish hairs of a dirty yellowish brown colour. The ears are clothed with short dark-brown hairs externally, and with

FIGURE 181.—Hind end of the skull of A. *M. fuliginosus* and B. *M. giganteus* to show the difference in form. Both the skulls are of the same basal length. Half natural size.

whitish hairs internally. The rhinarium is hairy to the tip, only a narrow margin of black naked skin surrounding the nostrils. The eyelashes are present on both lids, and are black in colour. The facial vibrissae are sparse and black, none of them measuring more than 60 mm. The claws are entirely black; on the manus that of the third digit is 30 mm. and on the pes that of the fourth digit is 35 mm. long. The male differs from the female in being considerably larger and usually somewhat lighter in colour. Old males nearly always have the chest almost white.

The skull presents some remarkable and constant characters, which serve to distinguish it at once from that of *M. giganteus*. In general it may be said that the great breadth of the posterior portion of the skull and jaws in *M. fuliginosus* readily distinguishes it from the mainland Grey kangaroo. This distinction is very easily appreciated by an examination of the skulls of the two species, and becomes obvious in a series of measurements. It is illustrated in scale drawing at Figure 181. The posterior nares are considerably lower than they are in *M. giganteus*, the breadth of the opening exceeding the height, whereas the reverse is usually the case with *M. giganteus*. The external pterygoid processes are shorter, stouter,

and more strongly everted than they are in the skull of any other kangaroo with which I am acquainted.

In *M. giganteus* the naso-palatine foramina are situated well behind the incisive canals; in *M. fuliginosus*, in contrast to *M. giganteus*, they are situated alongside the hind ends of the canals. Moreover, the maxillary-premaxillary suture, which in *M. giganteus* runs backwards some distance from the incisive canals before it turns laterally across the palate, runs obliquely backwards and outwards from the hind end of the canals in *M. fuliginosus*. (*See* Figure 174.) The nasal bones are relatively short.

These features serve at once to differentiate the skulls of the two species; but in addition to them there is the remarkable size and specialisation of the last upper incisor tooth, a feature to which Desmarest directed attention. His statement that " dans la mâchoire superieur, les quatres incisives intermediaires sont beaucoup plus petites que les laterales " may be rendered more precise by saying that the length of the last incisor exceeds the combined lengths of the two anterior incisors. This great size of the last incisor distinguishes the species from all other Kangaroos, for although the last incisor of *M. giganteus* is a highly specialised tooth, it falls considerably short of that of *M. fuliginosus*. (*See* Figure 182.)

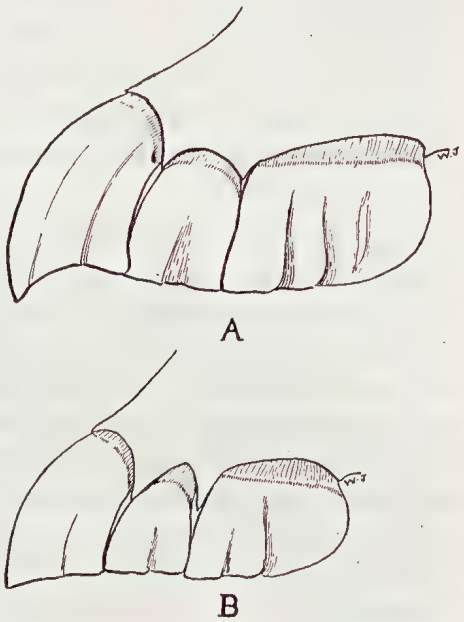

FIGURE 182.—The upper incisor teeth of the left side of A. *Macropus fuliginosus* and B. *Marcropus giganteus*. The skulls are of the same length and are of animals of the same age. Twice natural size.

The animal grows to a very great size, and it is safe to say that no really large specimen has every been examined by a zoologist. Skull No. 1 with a basal length of 187 mm. belonged to an animal which measured 8ft. 2in. (2,450 mm.) from nose to tail in the flesh. This specimen was not considered to be by any means a large one by men familiar with them, and since its fourth molar was only just beginning to erupt it was a fairly young animal. I have seen a living animal which I believe far exceeded this specimen. The skins of a typical young male and an older one (the latter measured by Mr. May) from Flinders Chase have the following

DIMENSIONS.

	(A)	(B)
Head and body	1,450	1,650
Tail	850	850
Hind foot	320	330
Ear	120	120

DIMENSIONS OF SKULLS FROM KANGAROO ISLAND.

	1 F.W.J.	2 S.A. Mus.	3 S.A. Mus., No. M. 1985.	4 F.W.J.	5 F.W.J.	6 S.A. Mus., No. M. 1890.	7 S.A. Mus., No. M. 1893.	8 S.A. Mus., No. M. 1892.
Basal length	187	180	162	156	156	152	144	140
Breadth	100	101	92	88	—	85	82	85
Nasals, length.....	72	67	55	56	53	52	52	55
Palate length	125	120	103	99	101	98	94	92
Diastema	56	53	42	42	42	41	42	42
Length of I^3	13	12·5	12·5	13	13	11	11	11
Width of back of lower jaw	100	100	91	90	—	85	84	83

None of these skulls belongs to an old adult. In No. 1, the largest of the series, the fourth molar is only just erupting. The remaining skulls are considerably younger.

Seen in its natural haunts it is a lumbering, rather stupid looking creature, clumsily built, and of slow movement. It must be by far the slowest of all the kangaroos and, as in the days of Péron, it is still easily run down in a comparatively short distance by a very ordinary dog. Many people must have heard, with varying degrees of incredulity, the stories of kangaroos picking up a dog and hurrying with it to the nearest waterhole wherein they plunge the dog and hold it under till drowned. In the case of *M. fuliginosus* this habit is a very real one, and every season the men who hunt these animals lose dogs in this manner. In the ordinary way, however, this kangaroo is the most gentle, and the quietest of all its kind. In captivity it shows little of the restlessness which characterises some, or of the truculence which distinguishes others. It is a placid creature, "innocent et foible" in 1924 as it was, when Péron described it, in 1802. Upon the western end of Kangaroo Island it lives in the densest bush composed of *Eucalypti* and *Melaleuca*, or in the scrubs of *Callistemon* and *Xanthorrhoea*, and comes out into the open grass-covered spaces to feed. It is by no means strictly nocturnal, and in the thicker parts of the bush it is not particularly shy. As a rule it is seen either solitary or in pairs, but occasionally small parties congregate in the open grassy places in the island. It breeds only once a year, the young is born as a rule in January and remains in the pouch until October.

Macropus fuliginosus still exists in some thousands on Kangaroo Island, and fortunately it is probable that quite half the kangaroo population is living on the reserve of Flinders Chase, which consists of some 200 square miles of broken bush-covered country at the western end of the island. Outside the reserve the legislation only grants the animal partial protection, the open season being from April 1st to September 30th. This lack of total protection is much to be regretted.

During the open season the kangaroo is killed very freely. In 1922 two men slaughtered 600 on a rather limited holding, and during the present season 300 more were killed at the same place. These animals are skinned for the leather trade. Although its tenure of existence appears assured within the sanctuary of Flinders Chase, the indiscriminate slaughter of this fine animal on other parts

of the island is much to be deplored. It is hoped that a full measure of protection will one day be accorded to the species throughout the whole of its island home.

The history of this species is a curious one. Flinders gives a good account of it as he saw it on March 22nd, 1802, and Péron, who visited Kangaroo Island between December 27th, 1802, and February 1st, 1803, adds many details of interest concerning it. Péron took specimens to Paris, and in 1817 Desmarest described these specimens and named the animal *fuliginosus*. Gould in 1863 expressed his doubts that the animal was still living on Kangaroo Island; and in 1871 Krefft stated that it was no longer to be found there.

In 1888 Oldfield Thomas, speaking of *M. giganteus var fuliginosus*, says, "This is obviously the usual Tasmanian climatic variety of the common kangaroo, and its modifications are just those which might have been expected. The original habitat of this form was said to be Kangaroo Island, South Australia, where Desmarest states, but with some doubt, that it was obtained by Péron and Lesueur. This doubt is confirmed by the fact that (*fide* Gould) it does not exist on Kangaroo Island, and by its common occurrence in Tasmania, where those collectors spent a considerable time." Later writers such as Ogilby (1892), Lydekker (1894), Lucas and Le Souef (1909), and Angel Cabrera (1919), do not even mention the possibility of its ever having lived on Kangaroo Island, or of the original specimens having come from there. They one and all assume that the Tasmanian animal is the type of the species and the only representative of it that has ever existed. Yet all the while that Gould's by no means dogmatic statement was being copied from book to book and gaining an air of finality in the process, the animal was living on Kangaroo Island, and its pelts were coming regularly into the salerooms of Adelaide, where, instead of being preserved as Museum specimens for a permanent memorial of the species, they became absorbed into the fur or the leather trade as the perfection of the pelage dictated.

It seems that there can be little room to doubt that the big Kangaroo of Kangaroo Island is the original type of *M. fuliginosus* and the same animal that was so graphically described by the early navigators. It is an animal that South Australians should be proud of, and do all in their power to protect and keep in perpetuity in its island sanctuary.

BRACHYDONT SECTION.

Genus 7.—SETONYX (Lesson, 1842).

This Genus contains only a single species which has commonly been included in the Genus *Macropus*. Its dental characters, however, separate it from all the other members of that Genus. The single species *Setonyx brachyurus* (the Short-tailed Wallaby) is a small Western Australian wallaby, not found in this State.

Genus 8.—DENDROLAGUS (Schlegel and Müller, 1839).

This Genus contains the beautiful Tree Wallabies, of which there are eight distinct species, all of which are confined to New Guinea or to tropical Queensland.

Genus 9.—DORCOPSIS (Schlegel and Müller, 1839).

The members of this Genus are confined to New Guinea. They may be defined as wallabies which, having become adapted or readapted to an arboreal habitat, like the members of the Genus *Dendrolagus*, have reverted to a terrestrial saltatory mode of life.

Family III.—PHASCOLOMYIDAE.

This Family, the third and last of the *Syndactyla diprotodontia*, contains only the Wombats, and these animals constitute one of the most curious and aberrant groups of the marsupials. Their correct position in any scheme of classification is a matter of some doubt, and very varying opinions have been put forward as to their true relationships. In certain features they show considerable likeness

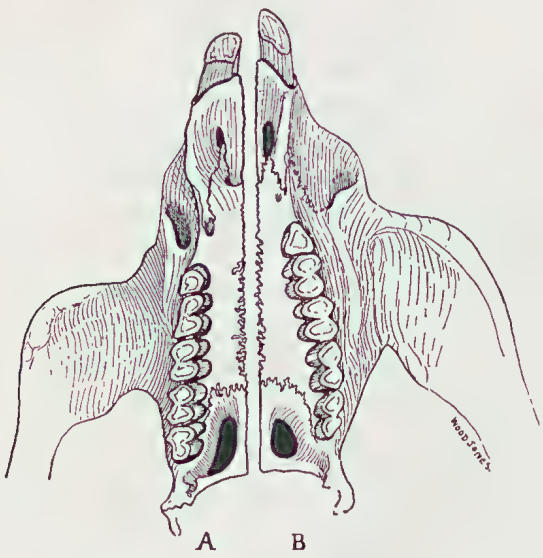

Figure 183.—The palate and teeth of A. *Lasiorhinus latifrons* and B. *Phascolomys mitchelli*. Half natural size.

to the Koala, and in some ways may be considered as terrestrial "Native bears." But in several important characters they differ so widely from these animals that the method of uniting them into a single family is not followed here. The Wombats differ from all other living marsupials in having only a single incisor tooth upon each side of both the upper and lower jaws (*see* Figure 183) and in having all the teeth rootless and persistently growing. Both of these conditions are frequently met with in the Monodelphian Rodents, but they occur only in the Wombats among the Didelphians. The dental condition of the Wombats shows the most remarkable parallelism in development to that of certain of the Rodents, and affords a most striking example of the similar modification of structure in response to similar demands of function.

Apart from the peculiarities of the teeth, the members of the Family are distinguished by possessing the following characteristics. The build is stout and clumsy. The limbs are short and stout, and of exceptional strength. There are five digits on both manus and pes, but on the pes the hallux is poorly developed. The tail is reduced to a mere rudiment. The number of ribs is large. The skull is massive, peculiarly flattened, and the bullae are very small and imperfect. The animals are terrestrial, fossorial, and nocturnal. They are confined to the southern portion of the continent of Australia, to the islands of Bass's Straits, and to Tasmania. The Family is best divided into two genera, distinguished as follows :—

External characters.—

(A.) Rhinarium naked. Coat coarse and harsh.

Genus 1. *Phascolomys.*

(A^1.) Rhinarium hairy. Coat soft and silky.

Genus 2. *Lasiorhinus.*

Osteological characters.—

(A.) Post orbital processes rudimentary or absent. Greatest breadth of nasals less than their length. Ribs 15 in number.

Genus 1. *Phascolomys.*

(A^1.) Post orbital processes strongly developed. Greatest breadth of nasals equal to or greater than their length. Ribs 13 in number.

Genus 2. *Lasiorhinus.*

The history of our knowledge of the Wombats is curious. These large, lumbering animals, which make such conspicuous burrows, were extremely late in being brought to the notice of zoologists.

Although *Phascolomys ursinus* has woven itself into Australian history, from its associations with Bass in his adventurous voyage into the Straits, and has left its imprint strongly on the pages of early Victorian comparative anatomy, the recognition of the various species was delayed in a very remarkable manner.

It seems strange that at the time when the minute and obscure Fat-tailed Pouched Mouse (*Sminthopsis crassicaudata*) was a well known and adequately described form, the South Australian Wombats were quite unknown as living animals, *Phascolomys mitchelli* being known only from fossil fragments, and *Lasiorhinus latifrons* only from a single skull.

The habits of all species are apparently so similar that they will be dealt with as a whole after the generic and specific characters are discussed.

Genus 1.—PHASCOLOMYS (Etienne Geoffroy, 1803).

This Genus contains four species, of which *P. ursinus* (Shaw, 1800), the first of all the Wombats to be made known to science, is confined to the islands of Bass's Straits. *P. tasmaniensis* (Spencer and Kershaw, 1910) inhabits Tasmania only, *P. gillespiei* (De Vis, 1900) is limited to Queensland, and *P. mitchelli* (Owen, 1838) ranges through New South Wales and Victoria and extends into South Australia.

Common Australian Wombat.

PHASCOLOMYS MITCHELLI (Owen, 1838).

Size large. Coat fairly long, but coarse and harsh. Under-fur sparse or absent. General colour of coat somewhat variable, but usually a grizzle of buff and black.

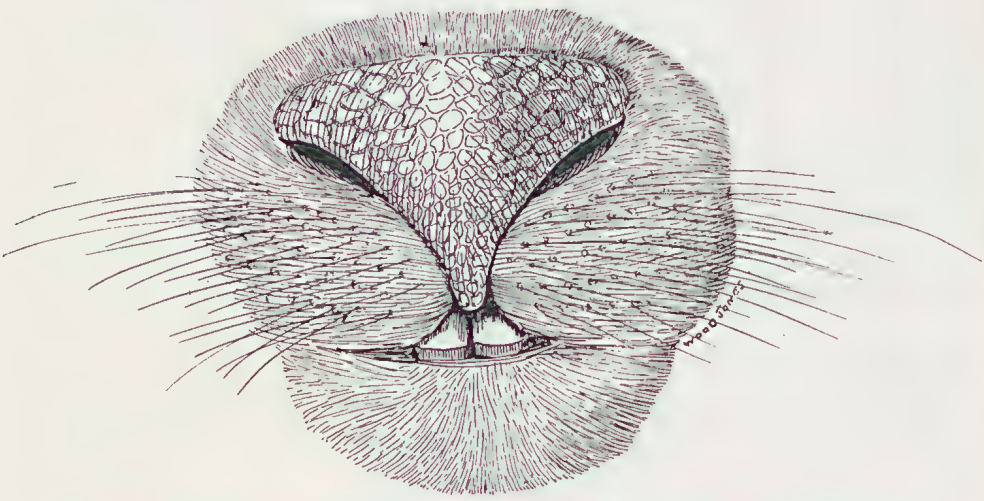

FIGURE 184.—Rhinarium of *Phascolomys mitchelli*. Two-thirds natural size.

The animal is uniformly coloured buff, grizzled buff, or nearly black, and has no markings anywhere on the body. The rhinarium is large, naked, and its limits are sharply defined. (*See* Figure 184.) The ears are short and simple. (*See* Figure 185.) The manus with naked and coarsely graunlar palm ; pads not well differentiated. Claws long and strong. Digital formula $3 > 4 > 2 > 5 > 1$. (*See* Figure 186.) The pes with coarsely granular, naked, sole. Pads ill defined. Claws long. Syndactylous digits very well developed. Digital formula $2{\cdot}3 > 4 > 5 > 1$. The hallux bears no nail. (*See* Figure 187.) Facial vibrissae extremely well developed and taking the form of coarse brownish bristles. All sets well represented, the supraorbitals measuring 77 mm. and the mysticials 97 mm. Eyelashes are sparse or absent, the pupil is circular, the iris dark-brown. The pouch extends more in front of the opening than it does behind. The nipples are two in number.

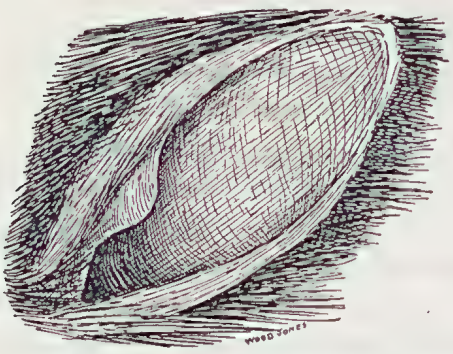

FIGURE 185.—Left ear of *Phascolomys mitchelli*.

The skull is large and massive. The infraorbital foramen is narrow and slit-like. Nasal bones large, expanded posteriorly, their greatest breadth about three-fourths of their length, their posterior margins bowed backwards in the centre. Interorbital region smooth, evenly convex, its edges sharp, well-defined, and continued backwards as ridges over the temporal region to the occiput. (*See* Figure 188.) The post-orbital processes rudimentary.

DIMENSIONS.

	Full-grown Male.
Head and body	*c* 1,150
Hind foot	110
Ear	45

DIMENSIONS OF SKULL.

	Brit. Mus.	Brit. Mus. Mt. Gambier.	Murray Bridge.
Basal length	185	161	162
Breadth	145	135	142
Nasals, length	81	70	58
Nasals, breadth	55	49	48
Palate length	125	106	102

Phascolomys mitchelli has the great distinction among animals in that it was known as, and named from, a fossil specimen long before the animal was known to be still living. The fossil remains of this creature were found by Sir Thomas Mitchell in the caves of Wellington Valley, New South Wales, and together with the remains of

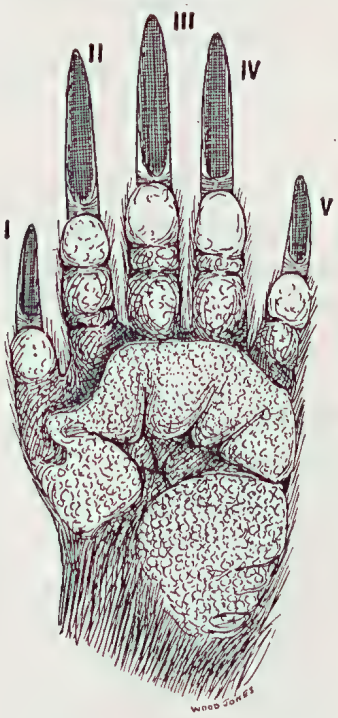

FIGURE 186.—Left manus of *Phascolomys mitchelli*.

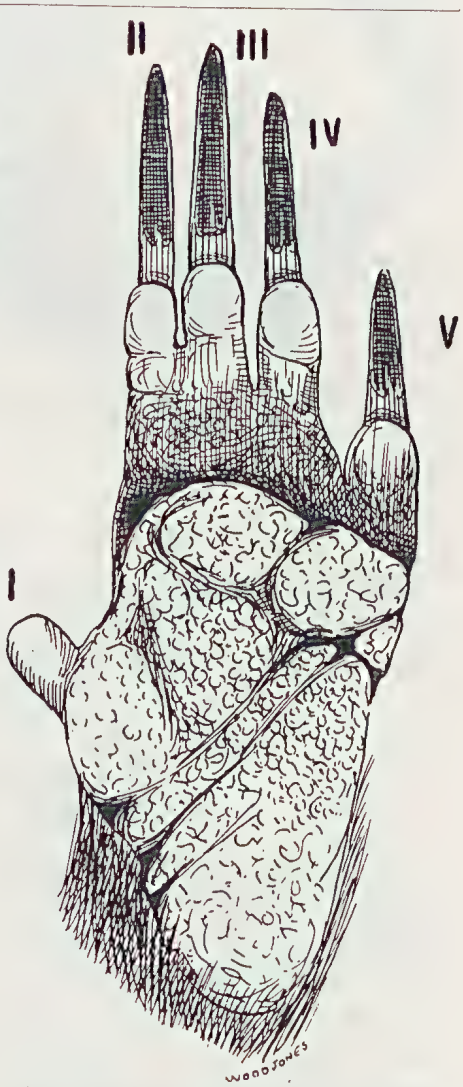

FIGURE 187.—Left pes of *Phascolomys mitchelli*.

the *Diprotodon* and other extinct marsupials they were submitted to Professor Owen.

At that time (1838) the only living Wombat known was *Phascolomys ursinus*, and Sir Richard recognised that Major Mitchell's fossil animal from the Wellington Caves was different from the living animal of the islands of Bass's Straits, and he named it in honour of its discoverer as *Phascolomys mitchelli*, and regarded it as an animal which had ceased to exist along with the *Diprotodon*.

FIGURE 188.—Dorsal view of the skull of *Phascolomys mitchelli*. Half natural size.

Although the newspapers frequently hold out to us the dramatic possibility of animals long regarded as extinct being captured in the dismal swamps of Central Africa or the wilds of South America, *Phascolomys mitchelli* still holds its great distinction of being the only mammal which was originally described as a fossil and which subsequently proved to be a living creature.

GENUS 2.—LASIORHINUS (Gray, 1863).

This Genus contains only a single species, a peculiarly South Australian animal, *Lasiorhinus latifrons* (Owen, 1845), known from the peculiarities of its rhinarium as the Hairy-nosed Wombat. (*See* Figure 189.)

Hairy-nosed Wombat.

LASIORHINUS LATIFRONS (Owen, 1845).

Size somewhat smaller than that of *Phascolomys mitchelli*. The coat is fairly long, soft, and silky. General colour grizzled-grey, but the whole animal not uniformly coloured as are the members of the preceding Genus. Face grey, tip of muzzle sharply differentiated, pale, almost white; the eye also delimited above and below by whitish patches. Ears comparatively long and narrow; hair around their bases white. Dorsal surface somewhat dappled, greyish, darker over the scapular region than over the hind quarters. Chin dark, cheeks, neck, and chest white, ventral surface and under portion of the body grey.

Limbs dark grizzled-grey on the outer side, white on the inner side. Syndactylous digits longer than in *Phascolomys mitchelli*.

Skull broad, flattened, and massive. The infraorbital foramen is comparatively widely open, triangular or oval, not slit-like as in *Phascolomys*. Nasal bones short,

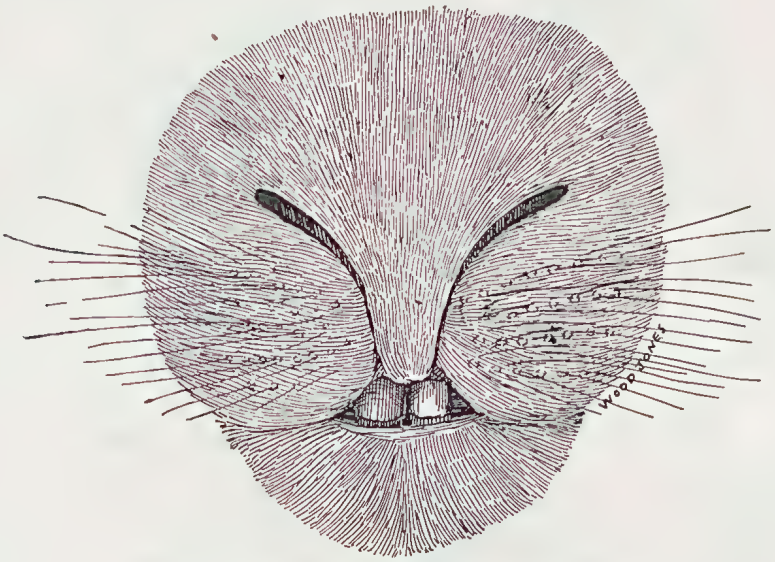

FIGURE 189.—Rhinarium of *Lasiorhinus latifrons*.

broad, and expanded behind, their greatest breadth equal to or greater than their length, their posterior margins almost directly transverse. The interorbital region flattened or concave in the centre. Post-orbital processes prominent and well developed. (*See* Figure 190.)

DIMENSIONS.

	Full-grown Male.
Head and body	*c* 900
Hind foot	95
Ear	70

DIMENSIONS OF SKULL.

	Brit. Mus. R. Murray, S.A.	F.W.J.	F.W.J.
Basal length	167	162	160
Breadth	144	128	126
Nasals, length	65	55	56
Nasals, breadth	67	63	58
Palate length	110	98	99

The Hairy-nosed Wombat has not the distinction, which appertains to *Phascolomys mitchelli*, of having been described as a fossil before it was known as a living animal;

but it has the next best claim, since it was known from a single skull many years before the actual animal was examined by zoologists.

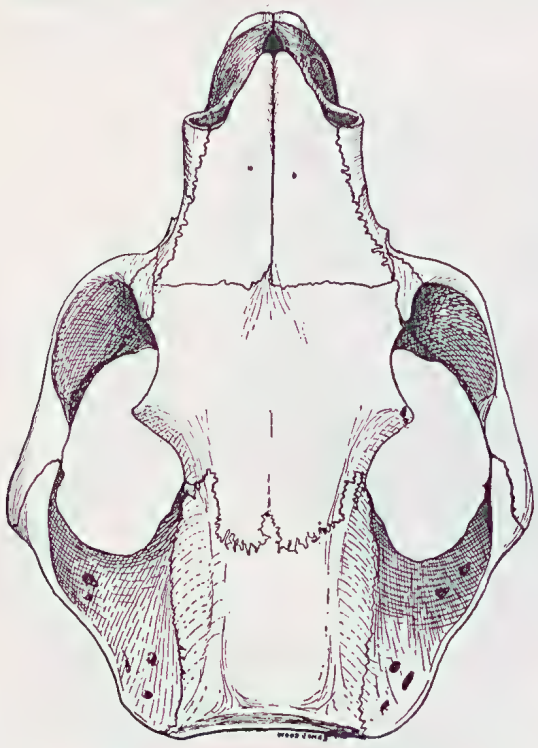

FIGURE 190.—Dorsal view of the skull of *Lasiorhinus latifrons*. Half natural size.

When Sir Richard Owen named the species he had only a single skull, sent to him from Mount Gambier, before him. He recognised that this skull differed from that of *Phascolomys ursinus*, which was the only other recent Wombat then known, in the great breadth of the frontal portion of the skull, and he therefore named the animal to which this solitary skull belonged as *latifrons*. From this skeletal peculiarity the animal was given the book name of Broad-fronted Wombat; but this popular name is now replaced by the designation of Hairy-nosed Wombat, since this name sums up the specific and generic characters of the peculiar South Australian species.

The Hairy-nosed Wombat is peculiar to South Australia and the eastern border of Western Australia, and Mitchell's Wombat is widely distributed in the southern portion of New South Wales, Victoria, and South Australia.

In South Australia the two animals overlap and, so far as can be ascertained, no details of their precise distribution have ever been recorded: nor do any observations appear to have been made as to whether the two species ever occupy the same territory or inhabit adjacent warrens, or on the other hand remain confined to definite and restricted areas. The only attempt that can be made here to define their distribution is to record the comparatively few localities from which specimens have been received by various institutions.

The following records stand for *Phascolomys mitchelli* :—Mount Gambier (Brit. Mus. and S.A. Mus.), Lake Alexandrina (Brit. Mus.), Murray Bridge (F.W.J. and S.A. Mus.), Mount Schank (S.A. Mus.), and Robe (S.A. Mus. and F.W.J.).

Lasiorhinus latifrons has been recorded from Port Augusta (Brit. Mus.), Port Lincoln (Brit. Mus.), River Murray (Brit. Mus.), River Light (Brit. Mus.), Fowler's Bay (S.A. Mus.), Yorke Peninsula (S.A. Mus.), Blanchetown (S.A. Mus.), Blyth (S.A. Mus.), Nullarbor Plains (S.A. Mus.), Eucla (S.A. Mus. and F.W.J.).

From this small amount of information it is not safe to generalise, but it would seem that *latifrons* lives over the northern part of the State from Western Australia to the Murray, and that *mitchelli* lives mostly in the South and South-East, the meeting of the two animals being upon the common ground of the Murray.

Wombats are nocturnal animals, shy and cautious, and exceedingly difficult to observe. But little intimate study seems ever to have been made of their habits, and although they are commonly present in the collections of the Zoological Gardens in Australia, I am not aware of any great additions to our knowledge having accrued from observations made on these captive animals.

The burrows which they inhabit are always easy to identify, firstly from their size and secondly from the form of their entrance, which is not circular, but, like those of the Platypus, is in the form of a low, flattened arch. I am not aware of any observations upon the system of the burrow or the relation of the breeding chamber to the general meshwork of tunnels. They appear to breed but once in the year and a single young is produced at a time.

Concerning the disposition of the animal itself, there is, first, the excellent and historical account of Bass's capture of *ursinus* on Cape Barren Island. The capture was effected easily, for " by placing his hands under its belly, he suddenly lifted it from the ground and laid it upon its back upon his arm as a child would be. It made no noise, nor any effort to escape, not even a struggle. The countenance was placid and undisturbed, and it seemed as contented as if it had been nursed by Mr. Bass from its infancy. He carried the beast upwards of a mile, and often shifted him from arm to arm, sometimes laying him upon his shoulder, all of which he took in good part until, being obliged to secure his legs while he went into the bush to cut a specimen of a new wood, the creature's anger arose with the pinching of the twine. He wizzed with all his might, kicked and scratched most furiously, and snapped off a piece from the elbow of Mr. Bass's jacket with his grass-cutting teeth. Their friendship was here at an end, and the creature remained implacable all the way to the boat, ceasing to kick only when he was exhausted." One may be pardoned for thinking that this is a better account of Wombat nature than anything that has been written on the hundreds of animals that have lived and died in the Australian Zoological Gardens since that time.

Another historical Wombat was the one brought home from one of the islands in Bass's Straits by " Mr. Brown, the eminent botanist attached to Flinder's voyage."

This animal " lived as a domestic pet in the house of Mr. Clift " (of the Royal College of Surgeons of London) " for two years." It was upon this animal, whose acquaintanceship with distinguished anatomists must have been very large, that Sir Everard Home made his observations. Of this animal Home recorded that " it burrowed in the ground whenever it had an opportunity and covered itself in the earth with surprising quickness; it was very quiet during the day, but constantly in motion in the night; was very sensible to cold; ate all kinds of vegetables, but was particularly fond of new hay, which it ate stalk by stalk, taking it into its mouth like a beaver, by small bits at a time. It was not wanting in intelligence, and appeared attached to those to whom it was accustomed and who were kind to it. When it saw them it would put up its fore paws on their knees, and when taken up would sleep in the lap. It allowed children to pull and carry it about, and when it bit them it did not appear to do it in anger or with violence."

These two accounts of the Wombat are over a century old, and as Lydekker noted in 1894, though Sir Everard Home wrote so long ago as 1808 " it does not appear that fresh observations have been recorded."

Surely it is high time that the authorities responsible for our Zoological Gardens, in which these easily kept animals are always confined (a century ago one lived for over five years in London) produced some fresh details of the intimate life of these animals, and our field naturalists recorded something of its life in the wild. The Wombat is an excessively powerful animal, its perfection of muscular development being one of the wonders of comparative anatomy. It is this extraordinary muscular power which enables it to dig its large tunnels into the very hardest sort of ground. It also possesses a good tough skin, and so it could probably hold its own under present day conditions, and with existing introduced enemies, if only it had adequate protection from man. That Wombats are harmless to small holders is not contended. So bulky an animal which drives tunnels with such ease is not, of course, desirable in closely settled or intensively worked agricultural areas. But South Australia possesses vast tracts where Wombats might burrow and live without detriment to any human enterprise. In these areas they need protection from man alone. *Lasiorhinus latifrons* belongs to South Australia almost exclusively. This State has been the sole custodian of *Myrmecobius rufus*, which is extinct, of *Caloprymnus campestris*, which is also extinct, and of *Wallabia greyi*, which is on the very verge of extinction. This is no very creditable record. The record would be worse if *Lasiorhinus latifrons* were to join these others and be added to the list of animals, peculiar to this State, which had been allowed to pass into the category of " exterminated within recent years."